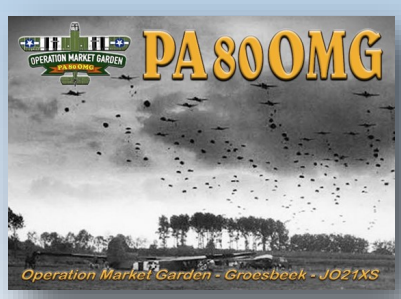
The Communicator

November—December 2024

All About 3D Printing

D-Day and Market Garden



Special Event Stations

The Bi-monthly Journal of Surrey Amateur Radio Communications

PUBLICATION CONTACTS

COMMUNICATOR & BLOG EDITOR John Schouten VE7TI
communicator at ve7sar.net

SARC TELEPHONE 604-657-8753

CORRESPONDENCE 14689 - 72A Ave,
Surrey, BC V3S 9L8
SARC at ve7sar.net

CONTRIBUTING EDITORS John Brodie VA7XB
Kevin McQuiggin VE7ZD/KN7Q

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Contributions of articles and photos are welcome.

During non-publication months we encourage you to visit the Digital Communicator at **ve7sar.blogspot.ca**, which includes recent news, past issues of ***The Communicator***, our history, photos, videos and other information.

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If you find ***The Communicator*** worthwhile, regular readers who are not SARC members are invited to contribute a donation towards our Field Day fund via PayPal.

SARC maintains a website at **www.ve7sar.net**

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In Radio Ramblings, Kevin VE7ZD/KN7Q takes us through his design and build of an SDR transceiver.

Do you know how many resources are out there for 3D printing amateur radio accessories? We'll take a deep-dive into the entire subject.

Don VE6HQ with a thorough overview of amateur radio test equipment on a budget.

...and so much more!

QSK?

-- -.- .-. --

...from the Editor's Shack

Do you have a photo or bit of Ham news to share? An Interesting link?

Something to sell or something you are looking for?
eMail it to ***communicator at ve7sar.net*** *for inclusion in this publication.*

Well another issue of the Communicator is off my desk. In my humble opinion, there are some truly remarkable articles in this issue. So much so that I expect to receive more kudos comparing The Communicator favourably to other commercial publications. We remain committed to staying ad-free with perhaps the exception being the back page which thanks our sponsors.

You will find an interesting discussion weighing the value of PDF publications such as ours to the 'more accessible/searchable' blog. It was started by Cale Mooth K4HCK and appears on 126. It has been discussed by our club directors and, as Editor, I have asked many of our local readers their opinion. The consensus to date has been that we can offer a much better product as a magazine-like PDF than we can on a blog. And, of course, we have a blog.

Unfortunately, the Internet Archive of Amateur Radio, which has all our past issues, and is easily searched, suffered a DoS attack a few weeks back. They are back online but, as with many of these occurrences one wonders what possible justification exists for removing our access to such a useful repository of all that is Amateur Radio history.

In closing for this issue, let me convey our best wishes for a very enjoyable holiday season.

73,

~ John VE7TI, Editor
communicator@ve7sar.net

This Month's Cover...

We recently had an excellent presentation on computer assisted design (CAD) and 3D printing by Adam Drake VE7ZAL, the high school instructor instrumental in offering the RF Communications course to local high school students.

This issue we take an in-depth look at this very useful addition to your amateur radio tool bench.

"Knowledge is power,
but knowledge shared is power multiplied." - *Robert Noyce*

On the Web

ve7sar.net

Between Communicators, watch your e-mail for news, announcements of Amateur Radio events, monthly meetings and training opportunities.

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The Rest Of The Story…

Karl Ferdinand Braun

Pioneer of Wireless Communication and Cathode Ray Technology

Karl Ferdinand Braun

Karl Ferdinand Braun, (6 June 1850 – 20 April 1918 in Fulda, Germany) was a German electrical engineer, inventor, physicist and Nobel laureate in Physics. His work laid the foundation for modern wireless communication and television technology. His contributions to the field of electronics, particularly his work with cathode ray tubes (CRT), the first semiconductor, and wireless telegraphy, earned him global recognition, including the prestigious Nobel Prize in Physics in 1909. This article explores Braun's life, his significant scientific achievements, and his lasting legacy in the world of technology.

Early Life and Education

Karl Ferdinand Braun was born to Johan Konrad Braun and Franziska Gohring Braun, the fourth child in their family. Growing up in the scenic Fulda region of Germany, he was educated at a local grammar school. His early years displayed a keen interest in science and mathematics, which led him to pursue higher education in these fields.

After completing his secondary education, Braun enrolled at the University of Marburg, where he studied chemistry and mathematics. His academic pursuits soon shifted toward physics, culminating in a PhD from the University of Berlin in 1872. Under the guidance of some of the most prominent scientists of the time, Braun honed his skills in research and experimentation, setting the stage for his remarkable career.

Early Discoveries and Academic Career

After earning his PhD, Braun took up a position as a graduate assistant at Wurzburg University, where he began conducting research into the properties of semiconductors. In 1874, Braun made a groundbreaking discovery: point-contact semiconductors could rectify electrical currents, transforming alternating current (AC) into direct current (DC). This insight into the behaviour of semiconductors would later become fundamental to the development of modern electronics, including diodes and transistors.

Braun's academic career advanced rapidly. In 1874, he joined the faculty of St. Thomas Gymnasium in Leipzig as a teacher. His expertise in theoretical physics soon earned him a position as an Extraordinary Professor at Marburg University in 1877, followed by a move to Strasbourg University in 1880, where he continued his research while teaching physics. His career took him across several prestigious institutions, including the Polytechnic School in Karlsruhe (1883) and the University of Tübingen (1885), where he helped establish a new physics institute.

The Invention of the Cathode Ray Tube

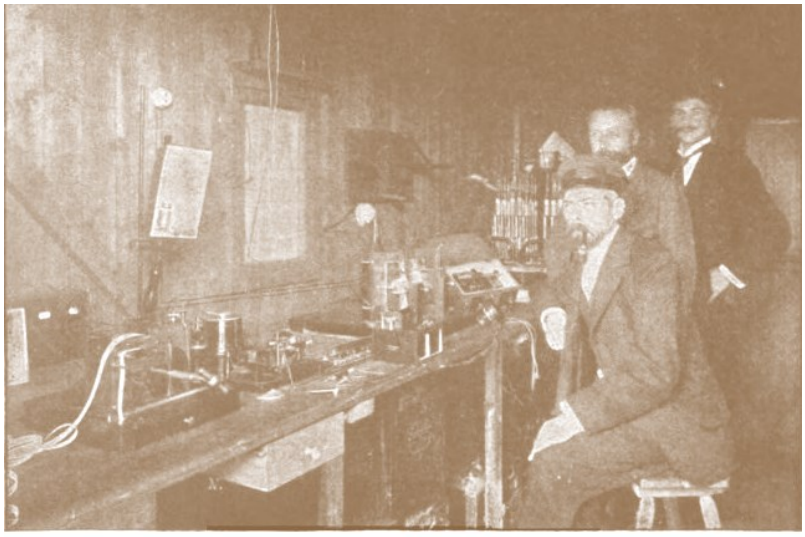
One of Braun's most significant contributions to science came in 1897, when he invented the Cathode Ray Tube (CRT). His CRT device, initially developed for scientific experiments, would later revolutionize television and computer displays. CRT technology works by firing a stream of electrons (cathode rays) onto a fluorescent screen, which produces images. Braun's CRT was a fundamental step in the evolution of electronic displays, and for nearly a century, CRTs were the primary technology used in television sets and computer monitors.

In conjunction with his CRT work, Braun also invented the oscilloscope, a device that allowed scientists and engineers to visualize electrical waveforms. This tool became essential for studying electrical signals and is still used in various forms today.

Wireless Telegraphy and the Birth of Radio

By the late 1890s, Braun's focus had shifted to another burgeoning field: wireless communication. He became part of a group of pioneering scientists exploring wireless telegraphy, a form of long-distance communication using radio waves. At the time, wireless telegraphy was seen as a groundbreaking technology that could transcend the limitations of wired communication systems, such as the telegraph.

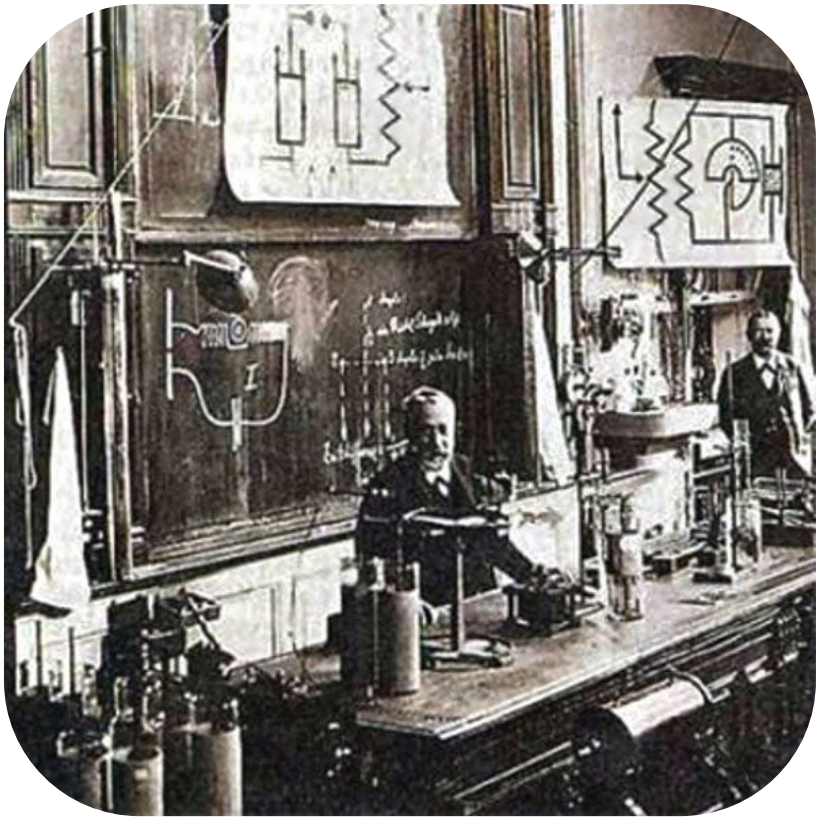
Braun's first major contribution to this field came in 1898, when he developed the cat's whisker diode, also known as the crystal rectifier. This device, made from a fine wire ("whisker") placed on a crystal, could convert alternating current to direct current, which allowed for better reception of radio signals. The crystal rectifier significantly increased the range and reliability of wireless communication, making it possible to transmit messages over greater distances.



PROFESSOR BRAUN IN HIS LABORATORY.

Braun's work on wireless telegraphy quickly gained recognition. In 1900, he demonstrated the potential of his technology by setting up a wireless telegraphy link between the city of Cuxhaven on the North Sea coast and the island of Heligoland, a distance of about 62 kilometres. This was a major achievement, as it demonstrated the practical application of wireless telegraphy in maritime communication.

In the years that followed, Braun continued to refine and improve wireless technology. By 1901, his work had contributed to the success of the first trans-Atlantic wireless transmission, a monumental step in the evolution of global communication. In 1902, he developed the inclined beam antenna, which improved the directionality of radio signals. This led to his discovery of the phased array antenna in 1905, a technology that allowed for more precise control of signal transmission and laid the groundwork for modern radar and smart antenna systems.



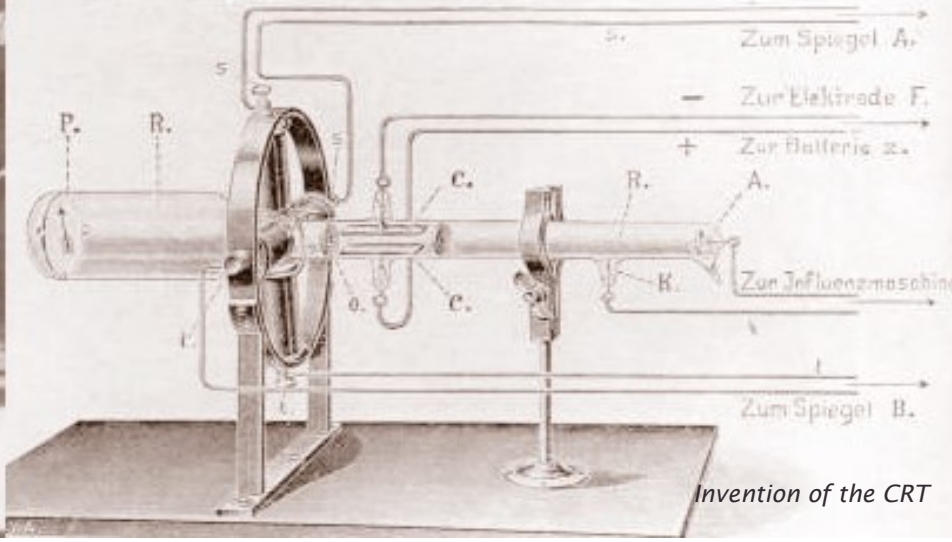
The Nobel Prize and Later Years
Braun’s contributions to wireless communication did not go unnoticed. In 1909, he was awarded the Nobel Prize in Physics, which he shared with Guglielmo Marconi, the Italian inventor widely credited with the development of the first practical radio system. The award was given in recognition of their joint work in the development of wireless telegraphy. While Marconi was known for his commercial applications of the technology, Braun’s contributions were more technical, focusing on the underlying science and improvements that made radio communication more reliable.

Despite his scientific achievements, Braun remained a modest and private individual. He continued to teach and conduct research at Strasbourg University, where he also served as the director of the Physical Institute.

A Difficult End to a Brilliant Career

In 1914, just before the outbreak of the First World War, Braun was called to the United States to testify in a legal dispute between the Atlantic Communication Company (ACC) and the American Marconi Corporation. The British-owned Marconi Corporation accused the ACC, which was based in Sayville, New York, of infringing on its patents for wireless technology.

However, when the First World War broke out, Braun found himself stranded in the United States. Unable to return to Germany due to the hostilities, he spent the remainder of his life in Brooklyn, New York. Although he was treated well and allowed to move about freely, Braun was unable to continue his experiments, as he did not have access to a laboratory. He lived with his son Konrad until his death on April 20, 1918, before the end of the war.



Invention of the CRT

Legacy

Braun's contributions to science, particularly his inventions of the CRT, oscilloscope, and advancements in wireless telegraphy, left an indelible mark on the world. His work laid the foundation for modern television, radio, and telecommunications, influencing generations of scientists and engineers. The technologies he helped develop, such as phased array antennas, are still in use today in applications ranging from radar systems to modern wireless communications.

His legacy extends beyond his scientific achievements. Braun was a dedicated educator and mentor, inspiring countless students and colleagues throughout his academic career. His humility and commitment to advancing human knowledge continue to serve as an example for future generations of scientists.

Karl Ferdinand Braun was a visionary whose work bridged the gap between theoretical physics and practical applications. His innovations not only transformed communication in his time but also paved the way for the interconnected world we live in today.

And that is his story.

~

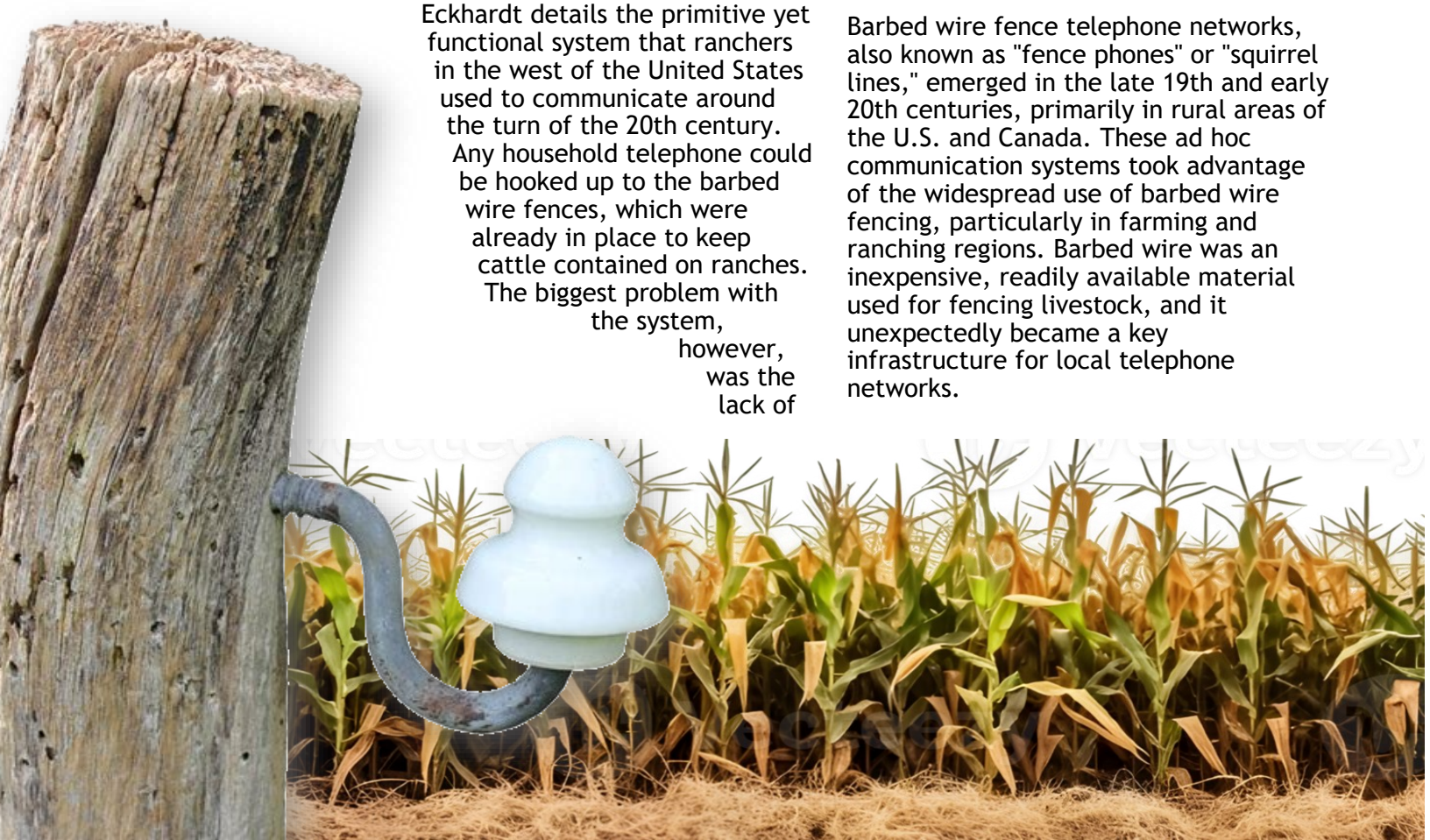
A Brief Look at Amateur Radio & Communications

Barbed wire fence telephone networks

An original social network?

We live in an age filled with reliable wireless phone service, but once upon a time people had to make do with nothing more than barbed wire. C. F. Eckhardt details the primitive yet functional system that ranchers in the west of the United States used to communicate around the turn of the 20th century. Any household telephone could be hooked up to the barbed wire fences, which were already in place to keep cattle contained on ranches. The biggest problem with the system, however, was the lack of an operator to direct calls: every phone connected to the network would ring whenever a call was placed. Despite the niggles, the system ultimately proved invaluable when it came to alerting fellow ranch owners to emergencies.

Barbed wire fence telephone networks, also known as "fence phones" or "squirrel lines," emerged in the late 19th and early 20th centuries, primarily in rural areas of the U.S. and Canada. These ad hoc communication systems took advantage of the widespread use of barbed wire fencing, particularly in farming and ranching regions. Barbed wire was an inexpensive, readily available material used for fencing livestock, and it unexpectedly became a key infrastructure for local telephone networks.



The Origins of Barbed Wire Telephony

The roots of barbed wire fence telephones trace back to two major developments in the 1890s. First, the price of barbed wire fell dramatically, making it affordable to farmers and ranchers across the western U.S. Second, the expiration of Alexander Graham Bell's patent monopoly on telephones in 1893 led to an explosion of independent telephone companies. These independent manufacturers offered affordable telephone sets that could operate outside the Bell telephone system, encouraging rural inhabitants to create their own communication networks.

Barbed wire fence telephones worked by connecting battery-powered telephone handsets to barbed wire fences, which served as the communication line between properties. Early telephones used DC current to carry voice signals and AC current to produce a ring. The signal quality was often surprisingly good, but weather conditions could cause short circuits, requiring creative solutions like using leather straps, corn cobs, or glass bottles as insulators.

Practical Uses and Social Impacts

Fence phone networks allowed rural communities to overcome isolation and share vital information, such as crop prices and weather updates. Additionally, the networks provided a means for social communication and emergency alerts. Unlike centralized Bell systems, which were often restricted to urban areas, fence phone networks were cooperative and free of monthly charges. Every call made on the network rang all phones connected to the line, and individual households developed personalized ringtones to distinguish who the call was intended for.

The communal line became a thing unto itself, according to historian Rob MacDougall:

Talk was free, and so people soon began to "hang out" on the phone, just as they do today in online social networks. "People would read the newspaper over the telephone," says MacDougall. "They'd have musical nights where someone would play their banjo, someone else would sing along, and others would listen." The shared line could even serve as a rudimentary broadcasting system. On many fence-phone networks, a single, very long ring would signal a "line call," an announcement of interest to everyone on the system. This might be a weather report, weekly livestock prices, word that the train would arrive late, or news of an emergency such as a prairie fire.

Before Prohibition came in 1919 every town had at least one saloon and most had several. Saloons discarded bottles—beer bottles, whiskey bottles, wine bottles. You name it, if it came in a bottle and could be consumed for pleasure, saloons stocked it and, when the bottles were empty, discarded them. Glass is one of the best electrical insulators there is. Bottles were collected from behind the saloons, the necks were broken off, wooden pegs were whittled to fit into the broken bottlenecks, holes were drilled in the pegs, and the "glass insulators" were nailed to fence posts.

Despite the informality of these networks, they became an essential part of rural life. They were most prominent in states such as Texas, Montana, and Colorado, with some systems reportedly operating well into the 1970s. The fence phone networks, like barbed wire itself, became a symbol of self-reliance and community among farmers and ranchers.

Cultural and Historical Significance

Barbed wire fence telephones illustrate the ingenuity of rural populations in adapting available resources to meet communication needs. In many ways, these networks were precursors to the more formalized rural telephone cooperatives that would later form in the U.S. and Canada. Their impact on rural communication, particularly in isolated areas, was profound and serves as a testament to the resourcefulness of those who relied on them.

The history of barbed wire telephony is largely undocumented but has been brought to light by scholars and artists in recent years. Artists like Phil Peters and David Rueter have even recreated these networks in modern installations, showing how this early, DIY form of telecommunications still resonates with contemporary audiences.

Barbed wire fence telephone networks represent an overlooked but significant chapter in the history of communication technology. They bridged the gap between the widespread availability of barbed wire and the demand for affordable rural communication in the pre-internet era, serving as a unique example of human ingenuity in adapting existing infrastructure for new purposes.

References:

[1] Krell, A., The Devil's Rope: A Cultural History of Barbed Wire (Reaktion Books, 2002)

[2] Kline, R., Consumers in the Country: Technology and Social Change in Rural America (Johns Hopkins University Press, 2002)

[3] MacDougall, R., The People's Network: The Political Economy of the Telephone in the Gilded Age (University of Pennsylvania Press, 2014)

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Early farmers built barbed wire telephone networks, also known as fence phones, by creatively adapting the materials they had on hand for both fencing and telephony. Here's how they generally approached the task:

Materials and Setup

Farmers would connect battery-powered telephone handsets to barbed wire fences, which were already widely used for keeping livestock in place. Barbed wire served as the communication line, allowing voice signals to travel between properties.

Essential components included

Barbed wire: The fencing material, usually made of steel with barbs placed at intervals, doubled as the communication medium.

Telephone sets: Early telephones had their own battery supply and were capable of producing both direct current (DC) for voice signals and alternating current (AC) for ringing.

I**nsulators:** To prevent short circuits caused by weather or contact with the ground, farmers used homemade insulators like leather straps, glass bottles, corn cobs, or porcelain knobs.

Fence posts and fasteners: These were used to string the barbed wire across long distances between houses and properties.

How it worked

Farmers would run a smooth copper wire from their house to the nearest barbed wire fence, and the barbed wire itself acted as the "phone line."

When a farmer cranked the telephone, it sent an alternating current through the wire, causing every phone connected to the same line to ring. The voice signal, powered by the telephone's battery, traveled over the wire, allowing clear communication between properties.

Challenges and Innovations

Farmers had to deal with signal disruptions caused by weather or physical damage to the wires. To address these problems, they improvised solutions such as adding extra insulators to keep the wires off the ground or patching broken wires with whatever materials were available.

Despite these issues, the quality of the voice signal was often quite good due to the thickness of the wire, though long distances or extreme weather conditions could cause interference.

Cooperative Networks

These telephone networks were entirely self-built and cooperative. There was no central operator, and calls would ring every phone on the network. Each household often adopted a unique "ring code" so people would know who the call was for. Since there were no monthly charges, these networks provided a cost-effective way for rural communities to stay connected.

The use of barbed wire telephone networks highlights the ingenuity and resourcefulness of early farmers in overcoming isolation and creating local communication solutions.

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News You Can't Lose

Amateur Radio's crucial role in communications during hurricane Helene

By: JOHN SCHOUTEN VE7TI

FOX News Channel 46—Charlotte, NC: "How old tech is being used to remotely help in wake of Helene"

When Hurricane Helene made landfall, it brought with it devastating winds and widespread destruction, leaving millions without power and traditional communication channels crippled. Amidst this chaos, amateur radio operators, as is so often the case, stepped up to provide critical communication support, showcasing their indispensable role in disaster response.

Hurricane Helene, a Category 4 storm, struck with unprecedented force, particularly affecting regions in Florida, Georgia, and the Carolinas. With winds reaching up to 140 miles per hour, the hurricane caused extensive damage to infrastructure, leading to power outages and the collapse of conventional communication systems. In such scenarios, the resilience and reliability of amateur radio become evident.

The Amateur Radio Emergency Service (ARES), the volunteer organization of licensed amateur radio operators, was activated in response to Hurricane Helene. ARES members were embedded in emergency operations centres across the affected areas, providing essential communication links between various agencies and the public. These operators facilitated the relay of real-time information, including weather updates, damage reports, and emergency requests, ensuring that critical messages were delivered despite the failure of other communication networks.

Another key player was the Hurricane Watch Net (HWN), a group of dedicated ham radio operators who monitor hurricanes and provide real-time data to meteorologists and emergency services. During Hurricane Helene, HWN volunteers were instrumental in tracking the storm's progress and relaying vital information from affected areas to the National Hurricane Center and other relevant bodies. This network of operators, spread across North America, ensured continuous communication even when local infrastructure was compromised.

In the aftermath of Hurricane Helene, amateur radio operators played a crucial role in reconnecting families and communities. With traditional communication lines down, hams in the Triangle area and beyond worked tirelessly to help people reach their loved ones. Their efforts not only provided a lifeline for those in distress but also highlighted the community spirit and dedication inherent in the amateur radio community.

"We started calling family members all across the country for these folks and saying, 'Hey, we talked to your loved one on ham radio, and they want you to know that they are alive and okay."

https://www.youtube.com/watch?v=3jXb9zwnO70

Page 13—News You Can Lose

The Lighter Side of Amateur Radio

BC Amateurs petition to have six meters stripped of its "Magic" designation

Vancouver, BC—*October 9, 2024*

A group of Amateur Radio operators in British Columbia have filed a petition in BC Supreme Court to have the word "Magic" removed from any reference to the Six Meter band.

Standing on the steps of the courthouse, chairman of the "Magic, What Magic?" committee, Adrian Stimpson VE7NZ, said, "After years promises about how great it will be when Cycle 25 hits, how great it will be when the solar flux is over 170, how we just need to wait until September, we've finally had enough. The only magic we see is a disappearing act!"

A large crowd joined in repeatedly chanting, "Hear hear! We don't hear… anything but static here!"

Their frustration is understandable. Many have spent thousands of dollars on antennas and radio equipment after being promised magic, only to be confronted with extreme boredom, leading some to become alcoholics, or worse… one ham was found dead in his operating chair, the Oprah Winfrey show on repeat on the television. The coroner report cited "extreme boredom" as the cause of death.

But there's more to this story. Neil King VA7DX, a somewhat respected contester and DX'er, has pointed out that there seems to be discrimination taking place. He notes that ARRL is headquartered in the eastern US and suggests "It's no coincidence that they get all the propagation on six meters. They are keeping it all to themselves. It's an outrage!"

Jury selection begins next week. The case is expected to include expert witnesses who will explain the hours of recorded silence that will be played to the jury.

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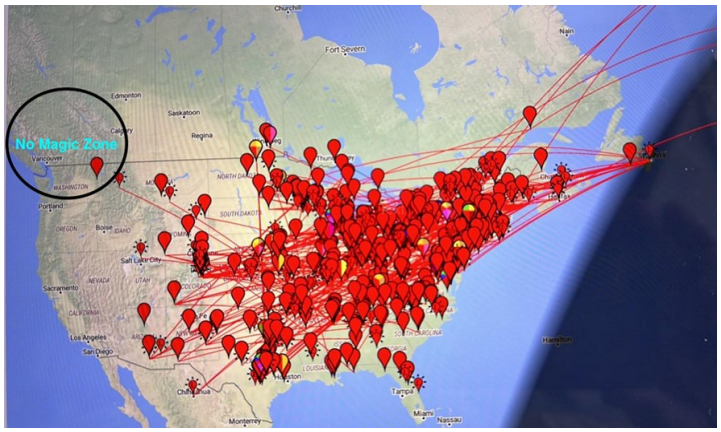
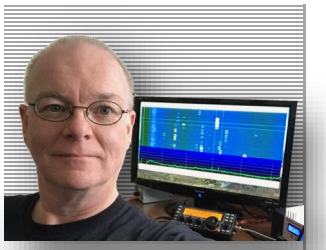


Evidence entered as part of the Supreme Court filing.

Radio Ramblings

A Homebrew SDR Transceiver

by KEVIN McQUIGGIN VE7ZD / KN7Q



Kevin VE7ZD/KN7Q is active in EME, meteor scatter and much more. He lives on Vancouver Island

All the best for the forthcoming holiday season!

This issue I would like to discuss a project that I have been working on for about two years. I've been on 23 cm (1296 MHz) EME since 2021, but in 2022 I started to think about how I could move my station from use of a "traditional" approach using a commercial rig to a purely digital, software-based solution utilizing an SDR transceiver.

I own an Ettus B200 software-defined radio (SDR) that can transmit and receive from about 70 MHz to 6 GHz [1]. It has a good receiver in it and can transmit at power levels up to about 200 milliwatts. It has a well-developed API (application programming interface), so I thought that it would fit the bill and allow me to write software to get me "on the moon" with a homebrew SDR at 23cm.

I started working on the SDR transceiver in early 2022, and now that it has reached an operational state, I thought that it would make a good article here in The Communicator.

The Traditional Approach

As I have described here in the past few years, EME operation has a lot of "moving parts". You need to have a suitable antenna, a preamplifier (a low noise amplifier or LNA) for your RX signals, antenna relays to protect the LNA during TX, good feedline and a transceiver to perform the actual communication with.

You also need a power amplifier for your TX signal to generate at least a couple of hundred watts at the antenna's feed point.

Most users on 1296 MHz and above use a parabolic dish antenna, and you need to be able to track the moon as it rises and progresses across the sky. If you can't point your antennas accurately at the moon you aren't going to make any EME contacts!

A computer is essential for tracking the moon, and this is usually accomplished through a tracking interface device that steers the antenna under command of a tracking program.

The last essential component for an EME system is a transceiver that receives and transmits in the band of interest. Amateur bands from 50 MHz (6 metres) up to 47 GHz have been used successfully for EME.

In this article I will be describing a system for use on 23 cm (1296 – 1300 MHz). For most EME operators this component is a commercial transceiver. The Icom IC-9700 is very popular among 23cm EME ops as it covers 1296 MHz and has a pretty good receiver in it. The rig generates about 10 watts of power on TX, and this can be used to drive a PA (power amplifier) to about 300 – 500 watts. A few hundred watts will get you heard off the moon and support making hundreds of QSO with other EMEers all over the globe. Path loss of signals to the moon and back is on the order of 250 dB.

Figure 1 shows the configuration of a typical 23 cm EME station that uses a commercial transceiver.

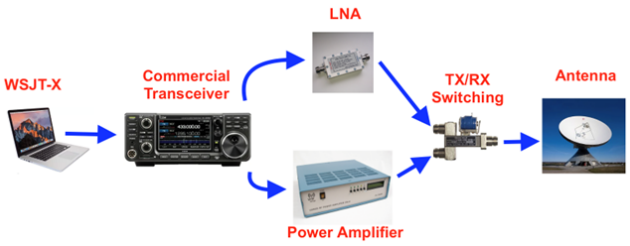


Figure 1 – Typical EME Station Configuration

Most operators use the popular open-source WSJT-X application (see [2]) and have switched to a new digital mode called Q65 for QSOs on 23 cm EME. Q65 is extremely sensitive and allows contacts to be made at very low RX signal levels. Q65 is part of the WSJT-X suite of digital modes. If you run FT4 or FT8 then you are already set up for Q65: you just need to select the mode in the program's setup menu.

WSJT-X runs on my MacBook Pro laptop, and it interfaces to my Icom IC-9700 via the rig's built-in sound card and CAT interface. For readers without a modern rig, a CAT interface allows the rig to be tuned and controlled by your computer. Most new rigs are equipped with CAT interfaces.

The system component that I wanted to replace for this project was the IC-9700. See Figure 2. My goal was to be able to remove the IC-9700 from the system and have it replaced by an Ettus B200 software defined transceiver.

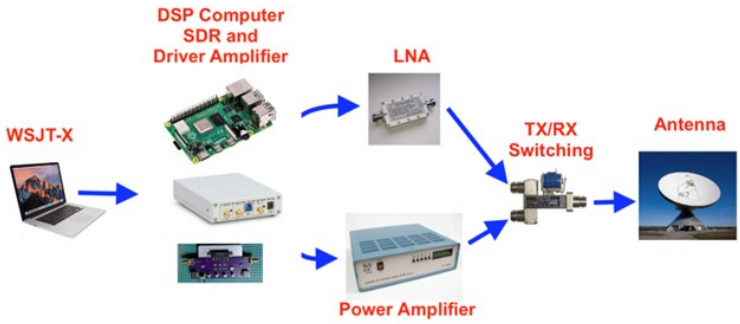


Figure 2 – Goal: Replacement of IC-9700

In this sense, this is a simple project, but I found that simply swapping out the IC-9700 for the Ettus SDR was much more complex than I originally thought. It required a lot of foundational work.

Why Bother with This Project?

My EME station works, and I have made several hundred QSOs. You may be wondering why I wanted to undertake this project. Here's why I decided to do it:

- Using an SDR transceiver would allow me to get onto more amateur bands, because of the frequency agility that SDRs provide. I could also use an SDR-based station for radio astronomy and for monitoring deep space probes at 8.4 GHz;
- The SDR solution would support all of WSJT -X's digital modes, plus CW, SSB, FM or any other mode;
- I wanted to design a solution that would work remotely. If I was able to get WSJT-X to talk with the SDR across a network, then I would be able to use my home EME station from anywhere in the world;
- The Ettus B200 generates only 100 – 200 milliwatts on transmit. I would need to design and build a driver amplifier for 1296 MHz. I had NO experience with this, but the project would be an opportunity to learn. The driver would need to amplify 100 – 200 mw input to about 1.5 watts so that it could drive my VHF Design PA to its rated 300+ watts output on 23 cm; and
- Finally, the project appealed to me because of its technical challenge. I would learn a lot more about digital signal processing and I would need to implement my own version of CAT control. I would also get some experience in the design and implementation of a microwave driver amplifier.

Category	Sub-Project Description	Notes
Software	CAT Control	- Investigate WSJT-X to see how it communicates with a traditional rig using CAT control - Write some code to fool WSJT-X into thinking that it is talking with a traditional rig
	Audio Transport	- WSJT-X expects to talk to a sound card - Write code to emulate a physical sound card and be able to run this code across a network, so that WSJT-X thinks it is talking to a physically attached traditional rig
	Digital Signal Processing (DSP)	- Perform the necessary DSP to convert audio streams to and from RF at 1296 MHz
	PTT and TX/RX Management	- Interact with WSJT-X over a network and be able to switch from RX to TX - Be able to set frequency, bandwidth, and other parameters on the SDR - Manage the inbound and outbound audio streams and their conversion to and from RF signals
Hardware	Driver Amplifier	- Measure the RF output of the Ettus SDR and design a driver amplifier that will amplify about 100 - 200 milliwatts to 1.5 watts, for input to the VHF Design 300-watt power amplifier

Amateur radio is as much about tinkering and learning as it is about operating, so I thought that this would be a really interesting and fun project.

The Project Plan

Every project needs a plan. As I have described in previous articles, the way to attack a complex problem is to break it up into simpler parts. The simpler components of the problem can be solved in any order, and once all the steps for a process have solutions then the parts can be integrated to solve the larger problem.

I took this approach to the problem and defined a set of sub-projects. They are in the table below left.

I had a lot of work ahead of me. I decided to leave the driver amplifier for later and start with the software side of the project. There's no point designing hardware until I knew that a software solution is possible!

First Steps - CAT Control

CAT control of the rig by WSJT-X is a critical requirement. The WSJT-X software needs to be able to control PTT switching on the radio and receive and transmit audio from the radio. It also needs to tune the radio and adjust frequency in real time for both the RX and TX sides of the signal because of the Doppler shift of signals as they travel to the moon and back. CAT control is also used to set the radio's mode, its bandwidth and some other factors.

WSJT-X expects to talk to a physical radio via a serial or USB port, or through a network connection. It expects to use CAT commands to interact with the radio and set its various parameters and states. I thought about this and decided that the best way to do it was to use a TCP/IP network connection from a machine running WSJT-X to make a network connection to a separate computer which would masquerade as a "virtual radio" that supports the CAT protocol.

I had a spare Raspberry Pi (rPi) 4B computer (see *[4]*) in the shack so I decided that I would use this as the "virtual radio". I needed to find out what CAT commands WSJT-X was using, and what responses it was expecting.

Fortunately, it is possible to monitor a CAT connection to be able to observe the interaction between WSJT-X and a physical rig. I set up a suitable monitoring environment and logged several minutes of interaction between WSJT-X and my Icom IC-9700. If I could emulate (replicate) the rig's response to WSJT-X's inquiries, then WSJT-X would be fooled into thinking that it was talking to a real transceiver.

I wrote the emulator in C. When it was finished, WSJT-X chugged along happily, talking to the rPi as if it was a fully functional transceiver. I was off to a good start.

Handling the Audio Data Streams

The next stage was to find a way to handle the RX and TX audio streams from WSJT-X. This has been the most complicated part of the project because of audio limitations imposed by the application.

WSJT-X expects to interact with a standard computer soundcard. For this project I had to find a way to simulate a soundcard in software and send and receive an audio data stream over the network to the rPi that was to serve as the interface to the USRP B200 transceiver. DSP code on the rPi would convert audio to and from a modulated RF signal at 1296 MHz.

I pondered this problem for a few days. The key to the solution was a virtual audio driver. This is a piece of software that emulates a soundcard and can be used by programs such as WSJT-X as a normal audio input/output (I/O) device. Much like the virtual CAT device, WSJT-X is "none the wiser" when it connects its audio streams to the virtual audio driver. It thinks that it is talking to a standard (and local) audio device.

The key element of the solution is that the input and output of the virtual audio driver can be redirected to another machine located remotely on the network:

- RX audio for WSJT-X to decode can be generated on the rPi and sent over the network to the virtual audio driver; and
- On the TX side, WSJT-X can generate its TX audio signal and the virtual audio driver can send this audio to the rPi across the network.

Choosing a virtual audio driver took much experimentation and research. There are many remote audio streaming applications out there on the Internet, both commercial products and open source.

I must have investigated a dozen different tools, applications, and audio processing systems but none of them were suitable for this project. They are targeted towards music streamers, broadcasting stations, recording studios and gamers, and the specific functionality I needed did not exist.

I experimented with several of these open-source solutions, and even one commercial product. I messed up my MacBook's audio by installing a popular audio routing package that was apparently "the Swiss army knife of audio processing". It had a terrible user interface, practically non-existent documentation, weak online community support, and (as I learned) a lot of unresolved bugs. The support forum said I should reinstall MacOS from scratch and wished me "*gud lukzz*". Sheesh!

I removed the package after two hours of trying to get it to work, but the uninstaller left some components behind that broke the MacBook's audio processing. After two more hours effort I found the problem. I crushed the remnants of the stupid tool, excised it from my system forever, and got the Mac's audio system running again.

Out of options, I was in a "best choice among poor options" situation. As a best fit, I chose a well-regarded open-source package called

"BlackHole" that provided the basic virtual audio driver functionality that I needed.

BlackHole *[4]* worked seamlessly with WSJT-X, but it could not transport audio over the network. However, it's virtual audio device could be accessed in real time by other programs running on MacOS. Other programs running on the Mac could read from and write to BlackHole's virtual audio device.

I was able to fill the network transport gap and get BlackHole audio moving over the network using two open-source tools called "sox" ("SOund eXchange") and "ncat", a utility for sending and receiving data over a network via TCP/IP or UDP sockets. See *[5]* and *[6]* for more information.

Both tools are well-respected UNIX applications that also run on MacOS. They've been around for decades:

- sox reads and writes audio files or streams in real time and can convert its input to different bit rates and encodings on the fly; and
- ncat can connect to remote machines and stream data in real time, either inbound or outbound.

The audio transport problem was solved. I would use BlackHole as a virtual audio driver for WSJT-X, and then transport the RX and TX audio to my remote rPi using sox and ncat.

Summary of Audio Transport Methodology

It's getting a bit complicated with all the various requirements and subcomponents, so here is a summary of how this system was designed to work.

A) Transmit Side:

WSJT-X transmit audio would run through BlackHole to sox and then be transmitted over the network to the rPi by ncat, where it could be run through DSP, up-converted to an RF signal at 1296 MHz and then transmitted by the Ettus USRP transceiver.

B) Receive Side:

RF received at 1296 MHz by the USRP would be down-converted and demodulated to an audio stream by DSP code, and then this audio stream would be sent over the network by ncat, processed by sox, and run through BlackHole, after which WSJT-X would read the audio stream from the virtual audio device and decode it.

C) Audio Format Conversion:

There's a "wrinkle" that I have not mentioned to this point. The specification for the audio channels used by WSJT-X is readily available from the program's setup guide: each audio channel runs at 48000 bits per second and contains a stream of 2-channel 16-bit integer values.

This data format isn't optimal for real time digital signal processing (DSP).

I chose the popular open-source package called "LiquidDSP" to do any digital signal processing that would be required. It's a fully functional package that I had used on other projects previously. It's free to download at *[7]* and the author is helpful if you have any questions.

I needed to simplify both the RX and TX data streams for transport over the network and processing by DSP code that would be written. I didn't need two audio channels and integers are a bit harder to use for DSP. I decided to use 32-bit floating point values for both the TX and RX audio streams. 32-bit floating point values are easy to use with the open-source LiquidDSP library.

Fortunately, the sox utility has the capability to convert data streams on the fly, so I added a conversion step on both the TX and RX audio streaming. Two-channel 16-bit integers would be converted to a single channel of 32-bit floats. This would be the project's standard format "on the wire".

I decided to do some testing to confirm whether this solution would work.

Conceptual Testing

I already knew that the CAT control was working. CAT is a low bandwidth activity as commands are generated at a very low rate of approximately once per second by WSJT-X. Interpreting, processing, and replying to these commands put virtually no load on the rPi.

Nonetheless, doing CAT control, audio streaming, DSP, and USRP device control on a single tiny microcomputer needed to be tested to see if it would work. Would the rPi have performance issues, trying to do all this processing at once?

It was important to run some tests to see whether this solution would work before I set out to write a lot of C code.

One of my biggest concerns was with network latency. WSJT-X is a real time application and timing is very important to it. Without accurate timing, decoding (and encoding) will not work. I wondered whether the virtual audio driver and the sox and ncat tools I planned to use would delay the audio stream such as to make decoding difficult, if not impossible. I also had concerns that network delays would have an impact on the system's performance.

I ran some tests, as shown in Table 1.

Test	Description	Result
Streaming audio file over the network	Send some music files (MP3s) over the network from my Mac to the rPi and write them to disk	I could play the received copy of the MP3
Streaming audio file over the network and play in real time	Send some music files (MP3s) over the network from my Mac to the rPi, and play them in real time	I could play the MP3 in real time as it was being transferred
Conversion of MP3 to 32-bit floating point	Check of format conversion "on the fly". Received stream written to file on rPi	File could be converted back to standard audio format and played
Conversion of MP3 to 32-bit floating point and play in real time	Same setup as in the last test but test playing the 32-bit data stream in real time	Overhead from "on the fly" format conversion did not impact performance

Table 1 – Audio Transport Tests

Next, I added BlackHole into the mix. I ran similar tests, but rather than send the MP3 file directly I piped the music file to the virtual audio driver, used sox to receive the audio from BlackHole, and then send it to the rPi as described above.

CPU loading on the rPi was not as bad as I thought it might be and showed only about 10 percent CPU utilization when everything was running.

I was encouraged by this record of successful tests. These had been conducted using a wired network connection (an Ethernet cable) between the Mac and the rPi. Would it work over WiFi? WiFi adds more latency because of the additional wrappers that encapsulate each data packet. However, I found that these tests worked just as well via WiFi as they did over the wired network.

Things looked good for the proposed solution to the audio transport problem.

The biggest remaining unknown was the load that the DSP code would add to the rPi. The DSP code was required because it would convert the WSJT-X audio streams to and from RF signals at 1296 MHz.

I had not yet tested this, although I had a bit of experience running LiquidDSP on a rPi. The loading aspect was significant as DSP requires "heavy lifting" – a lot of floating point math. Would the DSP load cause the roof to cave in? This would have to be determined.

DSP Processing

The rPi would be responsible for doing all the digital signal processing. As stated above, I had chosen the excellent open-source LiquidDSP package for this purpose.

EME operation on 23 cm takes place generally between 1296.0 and 1296.5 MHz. The greatest percentage of operation, however, is in the 100 KHz from 1296.0 to 1296.1 MHz. Operators may QSY higher, but the "watering hole" is between 1296.0 and 1296.1, with a standard calling frequency of 1296.065 MHz.

My SDR code would have to cover this frequency range for RX and TX, but I wanted to capture more bandwidth to give my transceiver more basic capabilities. SDR gives you that flexibility because you do not have to wind coils or build filters: this is all accomplished mathematically.

I chose a bandwidth of 960 KHz for my system. I would write the receiver first, and then add transmission capability after the receiver was working. 960 KHz would allow me to cover 1296.0 to 1296.960 MHz.

Why 960 KHz and not a full 1 MHz? I chose 960 KHz because it is a multiple of the target audio sample rate of 48 KHz! In DSP bandwidth is closely related to sampling rate. 960,000 divided by 20 equals 48,000: you'll recall that WSJT-X expects its audio channels to be running at 48,000 samples per second.

If my DSP code operated at 960 KHz bandwidth then after filtering and demodulation I would be able reduce the sample rate of a received RF signal to 48 KHz simply by decimating the baseband rate by twenty. The demodulated data stream, which is an audio signal, would then have the required sample rate of 48 KHz and be palatable to WSJT-X.

On the transmit side, WSJT-X generates a 48 KHz audio stream. I could easily increase the sample rate to 960 KHz by interpolating the input signal by 20.

960 KHz was a convenient sample rate for conversion to and from 48 KHz so that is why I chose it. In DSP, sample rate equates (generally) to bandwidth. I'd be able to capture 960 KHz of spectrum with the Ettus USRP.

Let's diverge for just a little bit of signal processing theory.

Baseband Signals, Interpolation and Decimation

In DSP terminology, a *baseband* signal is the raw signal that you are dealing with before any filtering or signal processing has been performed. The baseband signal for this project was a 960,000 sample-per-second (sps) stream of 32-bit floating-point values. It represents a chunk of RF between 1296.0 and 1296.960 MHz. Baseband signal processing consumes the greater amount of CPU resources due to its high sample rate.

Decimation is a method of reducing sample rate and isolating a narrower chunk of spectrum from a baseband signal. In this project I can decimate the 960,000 sps by 20 to reduce the sample rate to 48,000 sps. This has the effect of isolating a 48 KHz signal from the wider 960 KHz signal that is received off the air. Decimation by 20 is accomplished in DSP by choosing a single sample from the 960,000 sps baseband from every 20 samples. The other 19 samples are discarded.

Interpolation is used to convert a 48,000 sps stream to the target baseband of 960,000 sps. Each sample in the 48K stream is simply repeated 20 times. 48K * 20 gives a 960K signal. Interpolation is used to get a modulated signal ready for transmission at 1296 MHz.

We need to distinguish between audio and RF signals as part of these rate conversions. WXJT -X expects to receive a 48K *audio* stream – not a 48K *RF* stream! The RF baseband signal must be demodulated to audio before it is sent to WSJT-X.

Decimation from 960K to 48K is the very last step in the processing chain. The DSP code needs to select the correct subset of the 960 KHz baseband signal; demodulate the USB signal to recover its audio; and, finally, decimate the audio signal down to 48K sps.

Conversely, TX audio from WSJT-X needs to be modulated into a USB signal and then interpolated up to a 960,000 sps data stream before it can be transmitted by the Ettus SDR.

This sounds quite complicated, but LiquidDSP performs both these up- and down-conversions in only 4 lines of code for each process. That part is easy, but the rub is that you need to spend time learning about how DSP works before you can write the 8 lines of code!

As I have stated in previous articles, *you can do it!* It just takes a bit of time to learn!

SDR Packages

LiquidDSP is a DSP toolbox. It includes dozens of mathematical functions that implement the gamut of digital signal processing operations. There are filters, mixers, modulators, demodulators, interpolators and decimators, among many other more complex functions.

These functions are like radio "black boxes": each box accepts an input, does something with it, and produces a result as an output. All the input and output to these boxes is numeric: it consists of data streams of (usually) floating point numbers.

Think back to the radio system block diagrams that you studied when you were new to radio technology and in training for your amateur radio license or certificate. Recall that the block diagrams contained filters, mixers, modulators and other functions. The way that these blocks were interconnected determined how the radio circuit would work.

DSP packages like LiquidDSP (and the fantastic *gnuradio* package *[8]*) present you with a toolbox of blocks, and all you need to do to build a receiver or transmitter is to select some blocks and hook them up in the proper configuration. It's a fantastic approach to designing and building radios. Your errors can be easily corrected. No more soldering, and you don't have to purchase any components, power supplies or connectors!

Now, things are not as simple as they appear because there is complexity behind the way that all these blocks work. Success with LiquidDSP or gnuradio is dependent on sufficient groundwork being done by the user: you need to learn a bit about signal processing and things such as sampling, sampling rate, bandwidth, numeric representation of signals, and things like that.

It takes an investment of time and learning by the user to be able to gain the necessary foundational knowledge, but if you come to the field with an open mind and are willing to persevere and learn, then it is not too difficult.

To reiterate what I have said in past columns: if you have been successful in gaining an amateur radio certification or license, then you have the study and learning skills that will allow you to learn what you need to know about software defined radio and DSP. Don't be scared off by what might seem like complex math or confusing terminology!

Back to the Transceiver

The hardware for this portion of the project was a Raspberry Pi model 4B with 8 GB of RAM. It runs the standard "Raspbian" operating system *[3]*.

I write most of my code in the C programming language. This is a personal preference, but C is portable, fast, and simplifies low level control of memory, data structures, and devices that may be attached to the computer. It also allows efficient communication with other machines across the network and other processes that may be running on the machine simultaneously.

I had already written the CAT server that accepted a connection from WSJT-X and emulated (simulated) an attached transceiver. The CAT server received commands from WSJT-X to switch between RX and TX, set frequencies on the radio, change bands and perform other functions. I updated the CAT server to pass these requests to the transceiver software that I was to write next.

I started the transceiver software and wrote code that was able to communicate with and control the Ettus USRP SDR. I wrote routines to set frequency, bandwidth and sample rate and to switch the SDR from transmit to receive.

A complex aspect of this was handling the streaming requirements of the radio: on RX, the USRP streams samples at the requested sample rate (960,000 samples per second – see rationale above), and on TX it expects samples to be delivered to the radio at this rate. My code had to keep up, both on RX and TX. Otherwise, errors were generated and the SDR could hang up. It took quite a bit of work to understand the streaming model and write code that could satisfy the radio's requirements.

Once I had basic control of the SDR I turned to writing the DSP code that would process the audio streams to and from WSJT-X.

In RX mode, I had to receive the 960,000 samples per second (sps) stream from the radio, filter the signal, demodulate it to recover a 3.5 KHz USB signal and then transfer the resultant audio signal (at 48,000 sps) over the wire to the Mac running WSJT-X.

On TX, the path reversed. I had to receive a 48,000 sps audio signal, modulate it to USB and then mix it to an RF signal stream at 960,000 sps. These samples were delivered to the radio for transmission on the air at 1296 MHz.

LiquidDSP made this part of the transceiver code quite easy. Processing the RX signals from the SDR took only 27 lines of code, and TX took 37 lines. The reason the TX code is longer is due to the buffering requirements described above.

It took a few months to complete the transceiver code. I wrote the receiver code first. Despite the earlier testing I still had concerns about system loading on the rPi, but these were alleviated when on-air testing again showed no problems. With the CAT code and the DSP code running alongside the SDR interface and control code the rPi averaged about 37 percent CPU utilization on only 1 of the machine's 4 CPUs.

To generate a signal for the RX testing on the rPi, I used my Icom IC-9700 dialled back to 0 percent output power and put a dummy load on the radio's TX output. I would transmit across the basement, with the TX and RX stations separated by only about three metres (~10 feet). I drafted a spare computer to run WSJT-X and operate the IC-9700, to simulate a traditional EME station. It would use Q65 mode for the testing, with 60-second TX and RX periods, just as operators would use off of the moon.

The IC-9700 still generated a huge signal even at when set at 0 percent output power and into the dummy load, so I had to add attenuation at the Ettus SDR's receive input to prevent overloading the receiver. EME is a "weak signal" mode, after all. 30 dB attenuation (reducing the received signal to 1/1000th of its original received strength) did the trick. I was able to receive and decode Q65 signals. For curiosity I switched the transmissions to FT8, FT4, MSK144, and the obsolete JT65, and noted that they all worked. My SDR receiver was working well!

With RX working, I started in on the TX side. I needed to receive WSJT-X TX audio, process it, and send it to the Ettus SDR for transmission as described above.

Handling the TX stream processing proved to be harder than the receive code, largely due to the need to maintain a full transmit sample buffer without under- or over-flowing it. I had a persistent bug where the SDR would transmit the proper Q65 tone sequence, but it would inexplicably overlap transmit and receive periods despite the system clock being properly set. The bug would come and go, and it took a few weeks to figure out what was going wrong and stamp it out permanently. As is common in programming, once I figured out what was happening it was an easy fix.

With the timing correct, the test station using my IC-9700 was able to receive and

decode transmissions from the rPI and SDR. I conducted dozens of test QSOs across the basement in all of the WSJT-X modes. I used my American callsign KN7Q on the test station to make these loggable QSOs, and even uploaded them to Logbook of the World for posterity. After such a big effort I wanted to document it for when I am old!

Adding PTT

The last thing I had to add to the code before being able to use it in actual EME operation was push-to-talk (PTT) handling. I would need to be able to key my 300-watt power amplifier in order to deploy the new SDR-based system operationally.

The rPi has a 40-pin GPIO (General Purpose Input/Output) header on its circuit board. See [9] for a bit of an introduction into how GPIO works. I needed only a single pin plus ground to perform this keying function. I added code in the TX/RX switching section of my transceiver program to set GPIO pin 21 high (set it to '1') on TX, and to '0' on RX.

The GPIO pins cannot drive large loads like external PTT relays directly, so I breadboarded a simple interface circuit using a cheap opto-isolator chip (an H11D1) that would isolate the GPIO pins and the rPi from the PA PTT relay. The output of the opto-isolator can drive relays and similar higher current devices. To check that the GPIO was working I used a resistor and LED at 5V to provide a visual indication of when PTT went to TX. See Figure 3. D1 told me when the rPi was transmitting.

Opto-isolators optically separate one circuit from another by using light to transmit signals inside the chip. This ensures that the input circuit is never electrically connected to the output circuit. You can see the optical components schematically inside the H11D1 symbol in Figure 3. The input signal from the rPi GPIO is connected to pins 1 and 2.

The opto-isolator incorporates a LED receiver that it uses to control an internal transistor switch. Turning on the internal LED causes the transistor to conduct. The transistor has relatively high current capacity and can switch larger loads such as relays.

After over a year of work the SDR transceiver was almost complete!

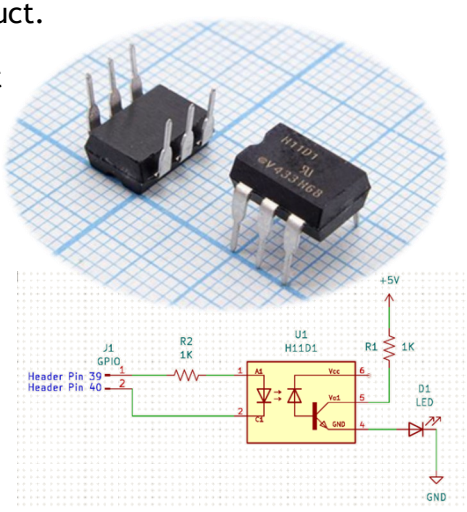


Figure 3 – H11D1 Opto-Isolator Chip and Circuit for PTT

Driving the Big Amplifier

Due to space limitations, I'll gloss over the development of a small driver amplifier. The problem I faced here was that the SDR power output is only about 100 - 200 milliwatts (mw) *[14]*.

200 mw is not enough power to drive my 300-watt power amplifier (PA). I needed to boost the SDR output to about 1.5 watts. 1.5 watts into my PA will generate about 330 watts – plenty of power for a 1296 MHz EME station. The solution was to use a small driver amplifier between the SDR and the PA.

However, I had no experience with driver amplifiers at all, and no experience with amplifiers that function above 1 GHz. It was another learning challenge. Off to the bookshelf and to the Internet I went, looking for background material and potential solutions. This consumed about six months as I had to multitask with real-world consulting work and other activities.

My learning experience with the driver could be the subject of a future article, but I'll summarize it for this issue.

In 1995 - 1996, I was involved in a 56 Kbps packet radio project that used an RF power module to generate RF power at 430 MHz. You could feed about 1 watt into this module, and 30 watts would come out. The module was made by Mitsubishi. It was a monolithic design and had only 5 pins: RF input, RF output, ground, and two power supply pins. The

module needed some bypass capacitors to eliminate stray RF, but that was about it. It was reliable and performed well in the packet radio project.

I am not a hardware guru nor an RF expert, so the simplicity of this potential solution was very appealing.

I thought that if these modules are still produced, and if there was a module that worked at 1296 MHz, then it could be just the type of simple solution that I was looking for this driver amplifier.

I went to DuckDuckGo and to my delight I soon found that sub-5 GHz versions of these modules still exist *[15]*. There was a Mitsubishi RF module, the M67796, that was rated for operation between 1240 and 1300 MHz *[10]*. Input power was maximum 20 milliwatts, and output power 2.5 watts. The module needs only five external connections, as shown in Figure 4.

2.5 watts output was more power than I needed, but I could limit the module's power output by reducing input power to under 10 milliwatts to produce lower RF output. The module would also run "cool" rather than near its design limits.

The M67796 was no longer in production but on additional searching I found "New Old Stock" (NOS) M67796 modules for sale at https://rfparts.com. They are under US$60 – a bit pricey, but worth the investment as the part would easily solve my driver problem. I bought two modules, just in case I blew the first unit up in testing *[11]*.

Fast forward: I used the data sheet for the M67796 to design a suitable driver circuit and built a small test amplifier on perforated board. It was ugly! See Figure 5. This circuit amplified its input a bit, but it was unstable and had a tendency to oscillate, so I considered this experiment only a marginal success. The perfboard construction, stray RF and poor grounding were likely causing the oscillation.

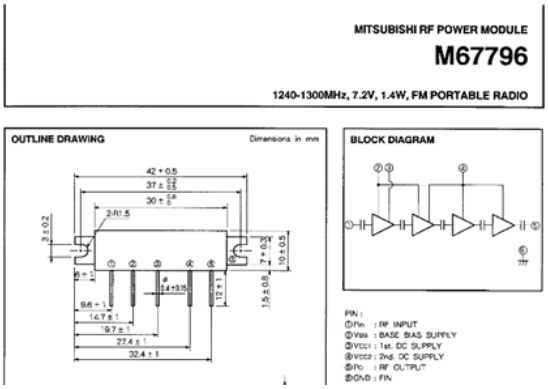


Figure 4 – M67796 Data Sheet (Excerpt)

For a "Version 2" experiment I used KiCAD *[12]* to design a small circuit board (PCB) with a good groundplane. It also included voltage regulators and had two SMA connectors for RF input and output. I ordered three copies of the PCB from OSH Park *[13]*.

The board arrived at my QTH in Courtenay in a couple of weeks. My Digikey parts order had also arrived, so I put the PCB together and ran the amplifier through a number of tests. With a more consistent layout on the PCB the amplifier worked quite well. It wasn't perfect, but I had good quality RF coming out and was happy as a first-time designer.

I will have to dial back the SDR's output to make sure that input to the driver never goes above 20 mw, lest it destroy the M67796 RF module. The assembled driver using the PCB from OSH Park is shown in Figure 6. Note the small aluminum heatsink; I added this because the RF power module can get quite warm. Without a heatsink,

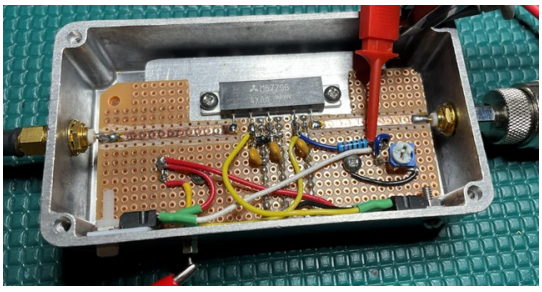
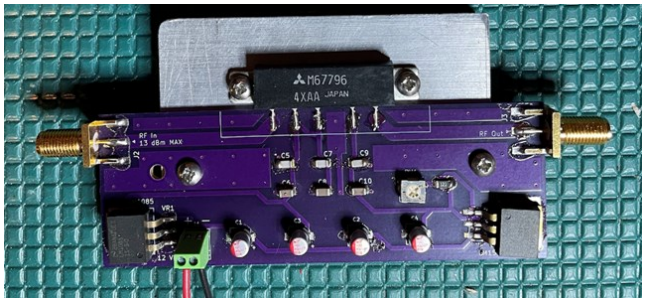


Figure 5 – Perfboard Prototype

internal temperatures can rise to dangerous levels and the RF module will be destroyed.

Figure 6 – Working Driver Amplifier, RF Module at Top



The Finish Line

With the arrival and testing of the driver amplifier and success with the GPIO-based PTT circuit, I am considering the SDR EME project almost complete. It was a long road, but an excellent learning experience.

My EME station is disassembled to avoid winter rain and snow damage until the spring. Once the weather improves, I'll deploy the new SDR -based EME station and see if it works in the real EME environment. I'll provide an update about this next spring.

Conclusion

That's it for this issue. I hope that you found the project and my path through it interesting.

If you have any questions or are interested in getting started in SDRs or DSP coding, then get in touch. If you're not familiar with C, this isn't a problem: much DSP coding is done in Python. You can also develop SDR applications graphically in gnuradio. There are lots of great projects to experiment with as you learn.

Feedback on Radio Ramblings is always welcome and may be directed to the Editor, or directly to me at mcquiggi@sfu.ca. Thanks for reading!

73,

~ Kevin VE7ZD / KN7Q

References:

[1] See https://www.ettus.com/all-products/ub200-kit/ for the B200.

[2] WSJT-X is free from https://wsjt.sourceforge.io/wsjtx.html. The user manual is also available on this web page.

[3] See https://raspberrypi.com. Documentation is available at https://raspberrypi.org.

[4] BlackHole is specifically for MacOS. It was developed in Vancouver, BC. It is open-source and available for download from https://existential.audio/blackhole/

[5] Sox is available at https://sourceforge.net/projects/sox/. It is a mature open-source product that has a myriad of uses.

[6] Netcat may be downloaded from https://nmap.org/ncat/. It is also an open-source utility.

[7] LiquidDSP's site is at https://liquidsdr.org/.

[8] I've written quite a bit about gnuradio in this column over the past five years. It's a fantastic learning and prototyping tool for digital radio. See https://gnuradio.org to download the package and read the quite-good documentation, including a lengthy series of tutorials.

[9] There's a great introduction to GPIO on the Raspberry Pi at https://projects.raspberrypi.org/en/projects/physical-computing/1.

[10] The M67796 data sheet can be downloaded at https://www.alldatasheet.com/datasheet-pdf/pdf/1533/MITSUBISHI/M67796.html

[11] Murphy's Law: if I bought just a single module, I would blow it up for certain. Buying two will ensure that I do not blow the first part up!! I'm new enough to hardware projects to always hedge my bets. Plus, I'll be able to build a second low power amplifier with the spare part.

[12] I wrote about KiCAD ("key-CAD") last issue. It is a fabulous free software package that is used in industry, academia and by hobbyists all over the world. Get a copy at https://kicad.org.

[13] I wrote also about the non-profit PCB fabrication service in Oregon called "OSH Park" last issue. OSH Park PCB boards are hobbyist-priced, high quality, and are delivered pretty quickly. As a bonus, OSH Park will not steal your intellectual property and sell it without your permission.

[14] SDRs that support transmission are never designed to produce high power outputs. This is by design, and you will find that all of the transmit-capable SDRs (the Ettus, Pluto, HackRF, et cetera) have this output power limitation.

[15] If you haven't tried the "DuckDuckGo" search engine then I would suggest giving it a try. It's at https://duckduckgo.com. DuckDuckGo doesn't track you or collect and sell your personal information. You can rely on it for unbiased search results that are not dependent on your personal browsing history. It's my default search engine, but I do use Google occasionally.

In the UK, routine availability of paper exams to end on 31 December 2024

A sign of things to come?

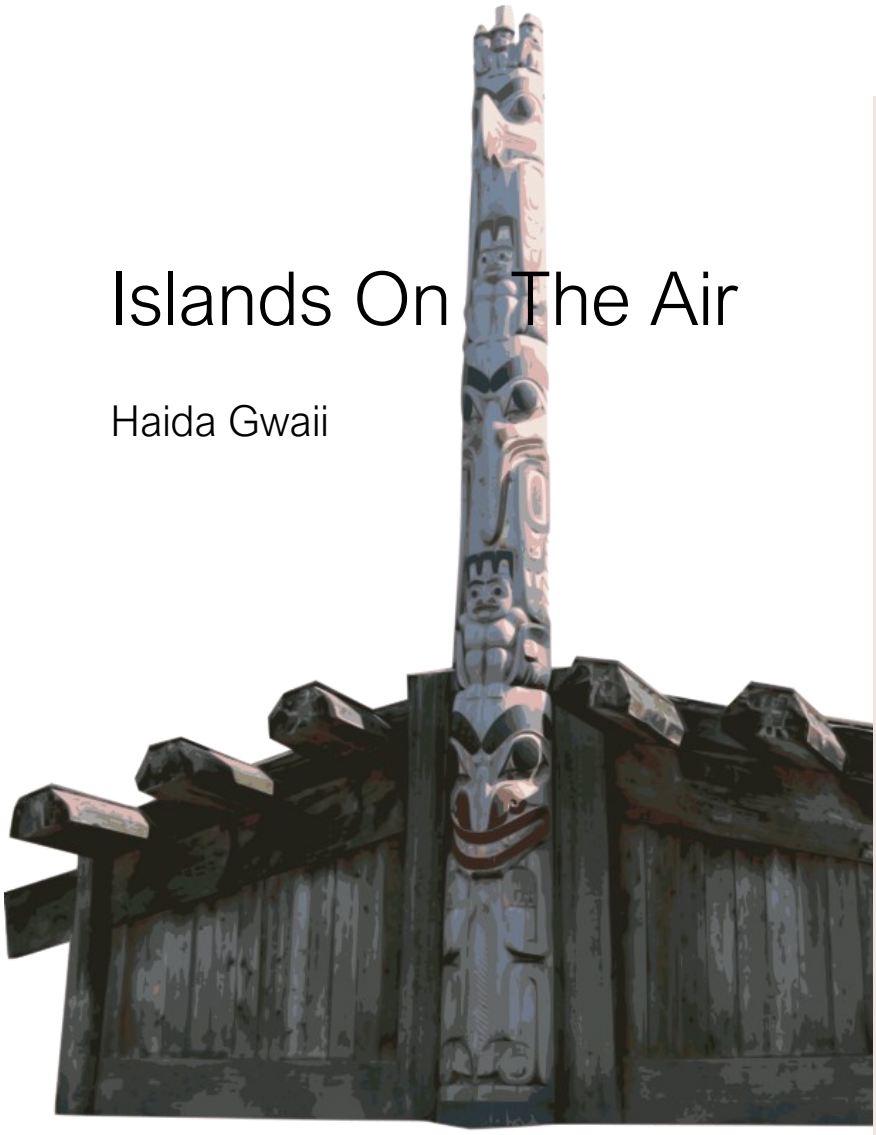
The RSGB is ending the routine availability of paper exams for amateur radio licenses on 31 December 2024. Paper exams will only be available for those with special educational needs or in approved cases. The final date to book a paper exam is 29 November 2024.

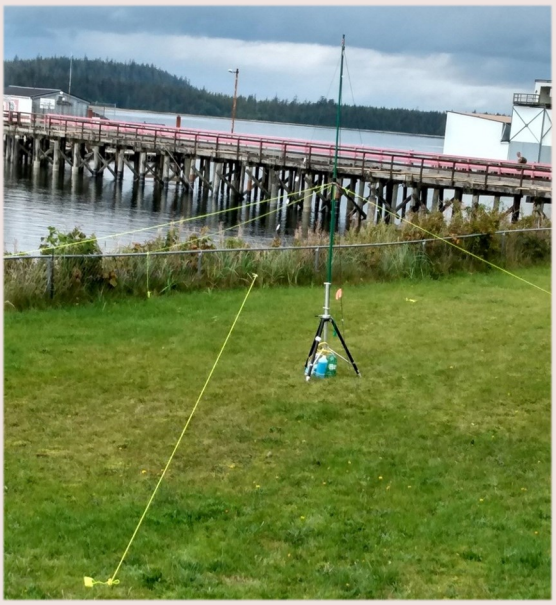
Currently 97% of amateur radio licence examinations are sat online using the TestReach platform, either at home under remote supervision or in a club setting. Following the implementation of Syllabus v1.6 on 1 September 2024, the new examination question bank will only be maintained online. Generating paper exams will involve significant additional work for the RSGB Examinations Department, with the associated costs. Therefore, from 29 November 2024, we will stop taking routine bookings for paper exams.

~ RSGB

Islands On The Air

Haida Gwaii





Jeanne VA7QD and her friend Margaret VA7VF braved the cool, rainy weather on Haida Gwaii, to make some great contacts! They used the 5-band linked HF dipole made by Jeanne at our HF antenna workshop and featured in *The Communicator* earlier this year.

Jeanne shared a funny story: "Some military guys staying at our hotel thought someone was playing a prank by setting up an HF antenna in the back. One of them even went to the front desk to ask who did it! They found out it was us! We got some great compliments from the guys about our antenna setup as we headed to breakfast this morning."

The antenna is now officially military approved!

73

~ Jeanne VA7QD &
Margaret VA7VF

3D Printing for Amateur Radio

Exploring projects and uses

By JOHN SCHOUTEN VE7TI

John Schouten VE7TI has recently become involved in 3D printing and has been busily trying various techniques.

Three-dimensional (3D) printing has revolutionized various fields by allowing the production of custom parts and tools at relatively low costs. For amateur radio enthusiasts, or "hams," 3D printing provides an exciting opportunity to design and fabricate specialized equipment and accessories tailored to individual setups. This technology is particularly valuable for creating components that are hard to find, expensive, or completely custom-built. With a bit of creativity and technical know-how, ham operators can craft everything from antenna mounts to enclosures for sensitive electronics.

In this article, we will delve into how 3D printing has influenced the ham radio community, the types of projects that can be printed, and how to get started with designing or downloading existing projects from repositories such as Thingiverse and Printables.

The basics of 3D printing in ham radio

3D printing, also known as additive manufacturing, is a process where a three-dimensional object is created layer by layer using digital models. The materials most commonly used are thermoplastics like PLA (polylactic acid) and ABS (acrylonitrile butadiene styrene), but specialized materials, such as PETG and nylon, are also available for creating more durable parts. These materials have become highly relevant to the ham radio community for building a wide range of practical items.

Benefits for the hobby

Customization: 3D printing allows for full customization of parts. This is invaluable for building specific components like enclosures for transceivers, custom knobs, or antenna mounts designed to fit unique setups.
Cost-Efficiency: Compared to traditional manufacturing or buying commercial products, 3D printing is more affordable, especially for niche parts. The only recurring costs are materials (filament) and the printer itself.
Prototyping and Experimentation: Ham operators often need to experiment with different antenna designs, mounts, or feedline connectors. 3D printing makes it easy to iterate through designs without significant cost or time investment.
Replacement Parts: If older equipment needs specific replacement parts that are no longer manufactured, 3D printing can be a quick solution for creating durable replacements.

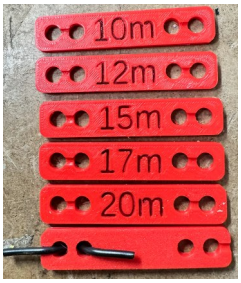
Popular projects for 3D Printing

Many ham radio enthusiasts have embraced 3D printing, and websites like Thingiverse and Printables have become treasure troves of free downloadable models. Below are some popular projects that are frequently printed and used in ham radio setups:

1. **Antenna parts**
   Antennas are an essential part of any ham radio station, and 3D printing makes it easy to build custom mounts, supports, and insulators. This is particularly useful for portable or temporary setups, such as field days or contests, where operators need lightweight and easily transportable components. Here are some examples of antenna-related 3D printing projects:

Linked antenna elements using inks of different colours

2. **Dipole centre insulators**
   These are necessary for separating the elements of a dipole antenna while maintaining their correct positioning. Many designs for insulators can be found on Thingiverse, which offer quick solutions to mounting antennas in the field.



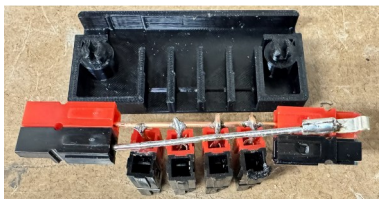
3. **Yagi antenna boom-to-mast adapters**
   A Yagi antenna is a popular directional antenna, and 3D printing a boom-to-mast adapter allows for the creation of custom mast mounts.
4. **Coaxial cable strain reliefs**
   These small but vital parts help prevent wear and tear on coaxial cables where they attach to the antenna, reducing the likelihood of failure.
5. **Handheld radio accessories**
   Handheld transceivers (HTs) are widely used in ham radio. 3D printing can significantly enhance their usability with the following accessories:

   - **Belt clips and holsters**
     Customizable belt clips and holsters are useful for securing HTs during mobile or field operations. These can be tailored to specific HT models to ensure a perfect fit.

- **Battery holders**
  Many designs for battery holders and packs exist, allowing users to expand or replace their HT's battery system. For example, printing a holder for AA batteries provides an alternative power solution.
- **Antenna extensions**
  To improve the performance of handheld radios, custom antenna extensions or mounts can be printed for better reach and placement.
- **Enclosures and cases**

3D-printed enclosures are an excellent solution for housing sensitive electronics and ensuring they are protected from the elements. This is especially useful for custom-built projects, such as remote-operated radios or weather stations. Popular projects include:

- **Raspberry Pi enclosures**
  Many ham operators use Raspberry Pis for digital modes like FT8, APRS, or logging. Custom cases with built-in ventilation or mounts for additional hardware like screens or GPIO ports are popular printing projects.
- **Power supply & PowerPole case**



Building a power supply for a transceiver requires proper housing to ensure safety and durability. 3D-printed cases are easily customized to fit the specific dimensions of the components.

PowerPole adapters and distribution boxes are expensive, but cost only a fraction of their retail price when printed.

- **Controller housing**
  For those using rotator controllers or similar equipment, 3D printing custom enclosures ensures proper fitment and aesthetic integration with other gear.

6. **Morse code (CW) keys**
   The ham radio community has long appreciated the tactile satisfaction of Morse code operation. 3D printing allows for the creation of custom straight keys or paddle keys for CW operation. Some designs are as simple as creating the physical key itself, while others incorporate moving parts and electrical contacts.
   - **Straight keys**
     While they will never match a solid brass key, 3D printed keys are simple yet functional. A 3D-printed straight key can be a fun project for any ham interested in Morse code. With the addition of metal contacts and a spring mechanism, you can create a fully functional key.
   - **Iambic paddles**
     For more advanced CW operators, dual-lever paddles, known as iambic paddles, can be designed and printed to fit personal ergonomic preferences.
7. **Microphone stands and accessories**
   A solid microphone stand is essential for clear communication. 3D printing offers flexibility in creating stands that fit specific desk setups and can hold microphones securely. Accessories like shock mounts and pop filters can also be printed to improve sound quality.

8. **Handheld transceiver stands**
   More than once had my handheld tumbled to the floor from my desk because of a bottom that is not flat and stable. There are free designs for stands to accommodate many models of handhelds.
9. **Portable antenna masts and supports**
   For ham operators who enjoy portable operations, such as Summits on the Air (SOTA) or Parks on the Air (POTA), lightweight and compact antenna supports are a necessity. 3D-printed mast holders, guy wire anchors, and tripod mounts make setting up an antenna in the field quick and easy
10. **Tuning and measurement tools**
    3D printing can also be used to create tools that help with tuning and maintaining radio equipment. For example, custom coil formers for inductors, knobs for tuning dials, and even SWR meter enclosures are all available or can be designed for 3D printing
11. **Cases for gear you may already have**
    I was amazed that I could find and print cases for a variety of test gear that I had purchased as kits online. My small 'scope and component checker are two that started life as only circuit boards leaving components exposed. I even found a case for the CW reader that we built as a club project earlier this year.
12. **Customizing and designing 3D prints for ham radio**
    While downloading pre-designed files from repositories like Thingiverse is convenient, designing custom parts is where 3D printing truly shines. Many ham operators have embraced CAD (computer-aided design) software to create their own unique solutions. An example may be a gear or a knob for a radio that is no longer made. And, if you have a recent iPhone or another capable camera, you have a method to do photogrammetry to photograph and create your own 3D models for printing.

Here's how you can get started…

Choosing the right software

Several free or paid CAD software programs can be used to design 3D-printable models. Some popular options include:

- **OnShape**
  Unlike file-based CAD, which required installation on your device, OnShape works via a web based interface… nothing to install. Cloud-native CAD provides a centralized repository of design data, eliminating the problems of lost data and the need for users to manage their own files. Onshape is accessible on any web browser, allowing users to access, manage and share their design data securely from anywhere in the world on any web-connected device.
- **Tinkercad**
  A free, beginner-friendly tool that's great for creating simple designs.
- **AutoDesk Fusion**
  A more advanced tool that allows for complex designs and precise measurements, ideal for creating intricate parts.
- **FreeCAD**
  An open-source option that offers solid modeling capabilities for those on a budget.

Design Considerations

When designing parts for ham radio, consider the following:

Material strength & tolerances
Depending on the application, you may need to select materials that offer more durability or flexibility, such as PETG or nylon.

Ensure your design accounts for the tolerances of your 3D printer. Fitment issues may arise if you don't leave enough room for screws, cables, or other parts

Electrical Isolation
When printing parts for antennas or power supplies, remember that plastic can act as an insulator. However, certain plastics may degrade when exposed to extreme conditions, such as heat or UV light.

Getting Started with 3D Printing for Ham Radio

If you're new to 3D printing and ham radio, here's a brief guide on how to start incorporating 3D printing into your projects:

1. **Selecting a 3D Printer**
   There are many options when it comes to selecting a 3D printer, but a few popular models for hobbyists include:
   - Creality Ender 3 KE
     This is the one I chose because, as a first printer, it is affordable, reliable, and widely supported by the community, making it ideal for beginners
   - Prusa i3 MK3S
     A bit more expensive, but known for its excellent build quality and ease of use
   - Anycubic i3 Mega
     A budget-friendly option that still offers excellent print quality.
2. **Materials**
   The type of filament you choose will depend on the specific application:
   - PLA: Easy to print with, environmentally friendly, and suitable for most indoor projects.
   - ABS: More durable and heat-resistant, suitable for outdoor projects or components that will be exposed to higher temperatures.
   - PETG: A good middle-ground between PLA and ABS, offering durability and ease of printing.
3. **Slicing Software**

To convert your 3D model into a file your printer can understand, you'll need slicing software. Printers come with their manufacturer's version, but Cura and PrusaSlicer are two slicers, allowing ham radio enthusiasts to combine both their interests and their fabrication tools into exciting, practical projects.

One of the most widely used software tools for converting digital models into machine-readable instructions for 3D printing is Cura by Ultimaker. It is open-source, free, and offers a user-friendly interface suitable for all experience levels. Another notable tool is PrusaSlicer, which, like Cura, provides users with powerful options for tuning and optimizing the printing process. Both slicers work well with the most common 3D printer models on the market

Final thoughts

3D printing offers amateur radio operators limitless opportunities to innovate, experiment, and improve their setups. Whether it's printing custom parts to repair an old piece of equipment or designing a new antenna mount for portable operations, the combination of ham radio and 3D printing opens a new frontier for creativity.

Thanks to repositories like Thingiverse, Printables and elsewhere, there's no shortage of ready-to-print designs, but creating custom solutions is where 3D printing shines. It's an invaluable tool for operators who want to build better and more efficient stations and accessories. Best of all, it fosters a spirit of collaboration, as 3D-printed designs can be shared freely among the global ham radio community.

As 3D printing continues to advance, we can expect even more high-quality, durable, and sophisticated parts that can withstand harsh environments and meet the rigorous demands of ham radio operators everywhere. For the amateur radio operator looking to step up their game, 3D printing is a key asset in enhancing both performance and creativity.

I hope this article serves as a comprehensive guide for anyone looking to explore the exciting world of 3D printing within the context of amateur radio! Would you like suggestions for specific ham radio projects available on Thingiverse?

~ John VE7TI

Where can I get print files?

Here are some great 3D printing projects for amateur radio enthusiasts that are freely available on **Thingiverse** and **Printables**:

1. Antenna Parts and Mounts

Antenna Mast Clamp: 3D-printable antenna mast clamps can be customized to fit various sizes of poles and masts, offering a durable and cost-effective solution for securing antennas in place.

Link: Thingiverse Mast Clamp

Dipole Center Insulator: A popular project for ham operators, a dipole center insulator can be 3D printed in a variety of sizes to suit different frequencies and configurations.

Link: Dipole Insulator

Antenna Base for Portable Operations: For hams who enjoy portable or QRP (low-power) operations, there are printable antenna bases that fold or disassemble for easy transport.

Link: Antenna Base

2. Enclosures and Boxes

Radio Enclosures: 3D printing allows for highly customizable enclosures for your radio equipment, perfect for housing electronics, transceivers, or other delicate gear.

Link: Enclosures

Power Supply Enclosure: Many ham radio projects need a power supply enclosure to protect wiring and prevent electrical shorts. A 3D-printed version can be modified to fit different power supply configurations.

Link: Power Supply Enclosure

3. Microphone and Speaker Holders

Microphone Stand: Keeping your workspace organized can be easy with a custom 3D-printed microphone stand that fits your specific setup.

Link: Microphone Stand

Speaker Mounts: Portable speaker holders can be used to mount communications speakers or external speakers for easier access and better sound quality.

Link: Speaker Mount

4. Cable Management and Connectors

Cable Organizers: Print customizable cable organizers for managing coaxial cables, power leads, and other radio-related wiring.

Link: Cable Organizer

Connector Holders: Keep all your adapters, SMA connectors, and other radio accessories neatly organized with a printed holder designed for small components.

Link: Connector Holder

5. Tuning Knobs and Dials

Custom Tuning Knobs: Print personalized, ergonomically designed tuning knobs for your transceivers or other equipment. This is a simple project, but one that enhances the user experience.

Link: Radio Knobs

6. VHF/UHF Yagi Antenna Elements

3D-Printed Yagi Elements: Some users have shared designs for the elements of a Yagi antenna, which are widely used in VHF and UHF operations. These can be printed and

combined with metal elements for a lightweight, portable Yagi setup.

Link: Yagi Parts

7. Portable Antenna Winder

Antenna Wire Winders: For operators who frequently deploy portable antennas, wire winders are a useful tool to keep your antenna wire tangle-free. Print winders that fit your specific wire gauge and length.

Link: Antenna Winder

8. Rotator Systems

Antenna Rotator: Advanced designs for motorized antenna rotators that can be controlled remotely are available. These allow ham radio operators to adjust the direction of their antennas without needing commercial rotator systems.

Link: Antenna Rotator

9. Call Sign and Frequency Displays

Call Sign Plaques: Many hams print call sign plaques or badges for their home station setup. This is a simple but fun way to personalize your station.

Link: Call Sign Badge & stand

10. 3D-Printed Keyers

Morse Code Keyer: For those interested in CW (continuous wave) or Morse code, you can print a functional keyer for sending code over the air.

Link: Morse Keyer

These are just a few examples of how 3D printing can be applied in amateur radio. From antenna elements to customized enclosures, the possibilities are vast and continue to grow with the creativity of the ham radio community. Each of these projects is available for free download and modification on **Thingiverse**, so you can print them as-is or tweak the designs to meet your specific needs. Happy printing!

~

Photogrammetry

Capturing 3D Objects with Photography for 3D Printing

3D printing has revolutionized the way we approach creating physical objects, whether for professional projects, hobbies, or daily use. However, many hobbyists are unaware that you can create 3D models simply by photographing real-world objects and turning them into 3D-printable designs. This article will explore the process of capturing 3D objects with photography and then printing them using a 3D printer, providing you with tips and tricks along the way.

Step 1: Understanding Photogrammetry
Photogrammetry is the process of using photographs to create 3D models. With the right software and technique, you can generate a highly detailed, printable model of any object by stitching together images taken from multiple angles. This process has become increasingly accessible for hobbyists, thanks to advancements in both camera technology and photogrammetry software.

Step 2: Equipment Needed
To get started, you'll need the following:

Camera: You don't need a professional DSLR, but a good-quality camera or a smartphone with a decent camera will do. If you have a LiDAR (Light Detection and Ranging) enabled camera, such as a late model iPhone or iPad *[see next page]* , then you are a step ahead. Whichever camera, make sure it has high resolution to capture the fine details of the object.

Turntable (optional): A motorized or manual turntable allows for easy rotation of the object while keeping the camera stationary. This is particularly useful for small objects, enabling consistent shots from different angles.

Photogrammetry Software: There are various free and paid programs, such as Meshroom (free), Autodesk ReCap, or Agisoft Metashape, that will help you process the images and turn them into a 3D model.

(Continued on page 37)

Scanning an Object with LiDAR

The first step in creating a 3D model from a LiDAR scan is capturing the object or scene:

Select Your Object: Choose the object or space you want to scan. Ensure it is well-lit and easily accessible from all angles. LiDAR works best with stationary objects and larger surfaces.

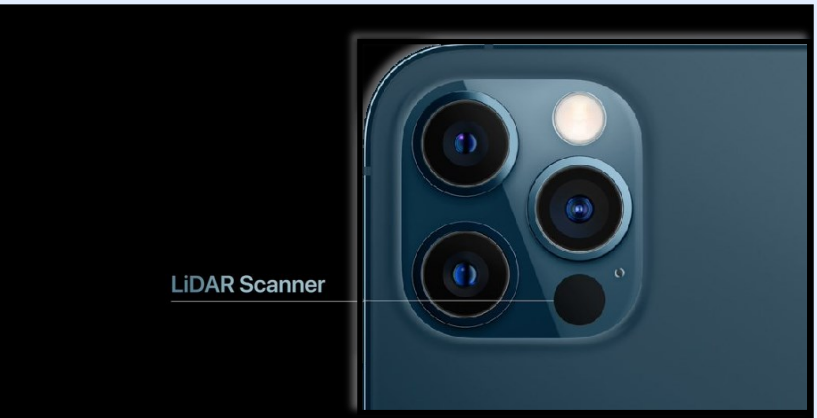
Set Up the LiDAR Camera: Open your LiDAR scanning app. For smartphones, apps like Polycam or 3D Scanner App allow you to point your phone camera at the object and start scanning. Standalone LiDAR sensors may have dedicated apps or software to start scanning.

Move Around the Object: To get an accurate 3D model, move the camera or LiDAR sensor slowly around the object, ensuring you capture all angles and surfaces. LiDAR cameras create a 3D point cloud based on the distance of the object from the sensor. The more data points captured, the more detailed the model will be.

Ensure Full Coverage: Walk around the object while scanning or use a tripod if you're scanning larger items or rooms. LiDAR is great for capturing depth information, so try to ensure you scan all relevant sides of the object.

Review the Scan: Once the scan is complete, the app will render a rough 3D model of the object. Review the scan for completeness and make sure no areas are missing or distorted. Most apps allow you to rescan specific parts if necessary.

Step 2: Post-Processing the LiDAR Scan
After capturing the LiDAR scan, you may need to process the point cloud or mesh to refine it before 3D printing:



Export the File: Most LiDAR scanning apps allow you to export the scan as a 3D file format like OBJ, STL, or PLY. Choose the appropriate format for 3D printing, typically STL for most hobbyist printers.

Import into 3D Modeling Software: Import your LiDAR-generated file into software like Blender or MeshLab. In this step, you can clean up the model, fill in any missing details, and remove unwanted artifacts or noise. Some apps have built-in smoothing tools that help to clean up the rough areas of the scan.

Repair and Optimize the Mesh: You may need to repair holes or incomplete areas in the mesh. MeshLab and Blender both offer tools to help close gaps, fill holes, and smooth surfaces. Reducing the polygon count (decimation) is also helpful for simplifying overly complex models without losing significant detail, making them easier to print.

Scale the Model: Make sure the model is scaled correctly for 3D printing. You can adjust the size and dimensions within your 3D modeling software or later in the slicing software.

Step 3: Preparing the File for 3D Printing
Once you have cleaned up and optimized your LiDAR scan, it's time to prepare the model for 3D printing:

Check for Watertightness: Ensure the 3D model is watertight, meaning there are no holes or gaps in the mesh. Most 3D printing software requires the model to be a solid object. MeshLab and Blender have tools to check and repair these issues.

Export as an STL File: Once your model is cleaned up and ready, export it as an STL file, the standard format used for 3D printing.

Import into Slicing Software: Open the STL file in your 3D printer's slicing software (like Cura, PrusaSlicer, or Simplify3D). The slicer will convert your 3D model into layers that your printer can understand.

Adjust Print Settings: Choose the appropriate print settings, including layer height, infill, print speed, and supports. If your model has overhangs, you may need to add supports to ensure it prints correctly.

Slice the Model: Once the settings are finalized, slice the model into printable layers and generate the G-code file that your 3D printer will use.

~

(Continued from page 35)

3D Printer: You'll need a 3D printer, filament, and slicing software to turn your newly created 3D model into a printable file.

Step 3: Capturing the Photos
Once you have your equipment set up, follow these steps to photograph your object:

Set Up the Object: Place the object in a well -lit environment. Natural light is ideal, but you can use artificial lighting as long as it evenly illuminates the entire object. Make sure the background is plain and uncluttered. Some users opt for using a green screen or plain white surface to make the object stand out more.

Take Photos from Different Angles: To create an accurate 3D model, you need a comprehensive set of images. Take photos from multiple angles, ensuring you capture every side of the object. It's crucial to maintain consistent spacing and overlap between the photos (about 60-80% overlap is ideal). The more photos you take, the better your model will turn out.

Use a Turntable (Optional): If you're photographing smaller objects, using a turntable can help by rotating the object incrementally. This allows you to keep your camera still and capture every angle without manually adjusting the object's position.

Adjust Camera Settings: Set your camera to manual mode to maintain consistent exposure and focus throughout the process. Automatic settings can adjust between shots, causing differences in lighting and clarity that can affect the final 3D model. Keep the ISO low to avoid grainy images, and aim for a higher f-stop (aperture) to ensure the entire object remains in focus.

Step 4: Processing the Photos
Once you've captured enough images, the next step is to process them into a 3D model. Here's how:

Upload the Photos to Photogrammetry Software: Import all your images into your chosen photogrammetry software. The software will analyze the images and map out the object's structure by triangulating points shared between overlapping photos.

Generate a Point Cloud: The software will create a point cloud, which is a collection of points that represent the surface of the object. This point cloud is then converted into a mesh, where the software connects the points to form a 3D surface.

Refine the Model: Once your 3D mesh is created, you can refine it by cleaning up any noise or unwanted features. Some photogrammetry software also allows you to texture the model, using the original photos to apply realistic textures to the 3D surface.

Export the Model: Once satisfied with the mesh, export it as an STL or OBJ file. These formats are compatible with most 3D printing software.

~

Stan & Cliff have been working all day on installing my clothesline, Mary.

The State QSO Party Challenge

Give it a shot

by VIC DICICCIO VE3YT

Vic VE3YT Early Field Day experiences gave Vic the contest bug. Sweepstakes is his favourite contest, but the recent addition of a JK Mid-Tri with 40m elements has made DX contests more exciting.

If you're the kind of person who:

- Wants to try contesting but are unsure of procedure or going fast on CW or SSB;
- Pretty sure you aren't competitive so you don't think contesting could be your ham radio jam;
- Likes hunting POTA stations and being a chaser, or activating a park;
- Enjoys a multi-stage activity to complete the whole set of something;
- Enjoys planning and executing;
- Planning to operate the BC QSO Party on the first weekend in February
- You're a marathoner rather than a sprinter by nature;

Then you should try the State QSO Party Challenge.

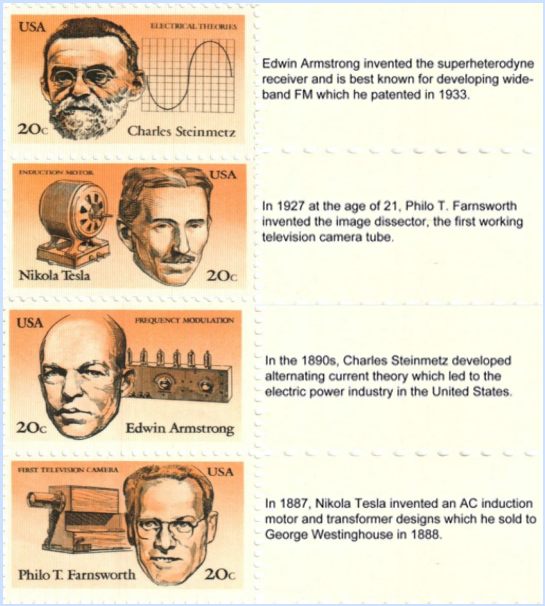
The Challenge includes 47 QSO parties, starting early in February on the weekend of the BC, Vermont and Minnesota QPs and ends in late October with the New York and Illinois QPs. In between are QSO parties that are very active, almost like a major contest, or less active (or at a distance where propagation doesn't favour you) such that you need to sleuth out your contacts. Most QPs target a single state or province, but some are regional like the Canadian Prairies, the 7th Call Area, and the New England QPs.

What happens in a QSO Party? Stations in the target state work stations outside the state and give their county in the exchange as a multiplier. Most QP organizers try to ensure every county is activated, sometimes by mobile or portable stations. As an out-of-state station, you send a signal report and your state or province in most QPs. Some require your QSO serial number, or your name, or your ARRL Section.

They are beginner-friendly in part because in-state participants really want a contact with you. They're willing to try several times to get your call sign on SSB, and slow down to your speed on CW. Many of the in-state CQers are

State QSO Party Challenge

The Kansas QSO Party has 57 1x1 calls for stations in Kansas, such as K0A, N0N and W0S. When you work these stations, you can use the suffix of these calls to spell out four words: KANSAS, SUNFLOWER, QSOPARTY, and YELLOWBRICKROAD. You will receive antique radio-related stamps for your first and second word, and for spelling all four words. (So up to three stamps.) The organizer, Bob W0BH, keeps track of which stamps you've received year after year, and when you have the initial nine progress in electronics, Voice of America and Samuel Morse stamps, you begin to receive the coveted four American Inventors series of 20 cent stamps issued in 1980.



beginning contesters, or experienced contesters having fun working new contesters, and the focus is less on winning than in major contests. Often it is easy to win a category and get a plaque or certificate.

The State QSO Party Challenge is an overlay that makes participating in QPs more fun. The Challenge aggregates your Qs across the 47 QPs in which you "qualify" by making at least two contacts. Your Challenge score is your total number of Qs times the number of QPs in which you have at least two contacts. At a score of 500 points you earn the Bronze Award, then 5,000 for Silver, 10,000 for Gold, 25,000 for Platinum and 100,000 for Diamond.

Participation in the State QSO Party Challenge is easy. Just report your QP results on 3830scores.com and you are automatically entered in the State QSO Party leaderboard. Your participation also counts towards whichever club you enter on 3830 in the Club Challenge. Remember that you still need to send your log to each state QP organizer as specified in each QP's rules.

Several people in my local Kitchener-Waterloo Amateur Radio Club (KWARC) enjoy QSO parties as an operating activity and a reason to get on the air. In recent years, five of them have worked all 47 QPs in the Challenge, earning the Worked All QSO Parties Award. This year, three of us have achieved the Diamond Level.

So for Surrey Amateur Radio Club members, next year when you are participating in the BC QP, make the effort to work a few Vermont and Minnesota stations and get their counties, and report your results in all three QPs individually on 3830. Three weeks later, work the South Carolina QP on Saturday and the North Carolina QP on Sunday. Plan to make at least two Qs to qualify and stick around if you're having a good time. Soon you'll find yourself trying to get at least 2 Qs in each QP and often making a lot more.

In most QPs there are a bunch of loud home stations to search and pounce, and put in your log. The next level is to track the mobile stations as they move from county to county, because they count as a new contact in each county. You might find yourself close to working all the counties and searching for the ones you're missing, or coming back to the shack after a few errands or family commitments, to check on the mobiles and pick up a few more counties. Or you may check in again in the evening to work a few more on 40m or 80m once everyone has moved down to the lower bands.

To prepare for a QSO party, skim the rules to confirm the exchange and note the recommended frequencies where in-state stations are likely to call CQ. Check whether the modes include FT8 and whether 80m is allowed. Print out a sheet of official county abbreviations which are especially useful on SSB when someone says they're in Orange county and your logger is expecting you to enter ORAN. There will probably be up-to-date info on mobiles and portables, including a list of counties they intend to travel through, perhaps with target times. Check how your logger works to enter stations on county lines. These stations give more than one county at once, so they count as multiple QSOs. N1MM uses slashes between the counties, so a station on the county line between Waterloo, Oxford and Perth counties in Ontario can by entered as WAT/OXF/PER. In N1MM, open the Multiplier window to see the counties you've worked, and the Available Multipliers window to see counties available from spots.

Often there is more than one QSO party on a given weekend, and you need to know how to quickly change logs in your logging method of choice. There are several strategies, such as paper logging for the "secondary" QPs, and one ham told me he goes as far as to have individual laptops with logs for each QP. Loggers such as N1MM+ and N3FJP have ways to quickly switch among logs to accommodate weekends with multiple contests. In N1MM a single log called IN7QPNE can be used for the weekend of the 7th Call Area, New England, Indiana and Delaware QSO parties. This single log can be sent to each QP organizer, and they will extract the relevant contacts. To report the individual QSO Party results on 3830, use this multiple QSO party log extractor to tease your log apart.

All QSO parties allow spotting, either for everyone or as a category in the contest. Many have their own spotting pages (look for this on the website) or use qsopartyhub.com. Because spotting is allowed, you can get a group of friends together virtually, each in their own shacks, and message each other when you find stations the others need, such as rare counties, especially for stations only using SSB. It's fun to cheer each other on, in a group, to get your two Qs to qualify, or to hit targets like 50 or 100 contacts.

In summary, if you have fun being chased in the BC QP, you owe it to others to chase them in their state QPs. If you enjoy POTA or county hunting, you'll enjoy QPs. They are a low pressure contest and a great way to improve your skills if you're new or apprehensive about big contests. The State QSO Party Challenge amplifies the fun by increasing participation and motivating you to check out each QSO Party. Even when you're too busy to spend much time in a QP, you'll find yourself getting on briefly to "get your two". Give it a try in 2025.

As a member of the State QSO Party Challenge Committee, I'd like to convey our thanks to ICOM and Ray Novak for sponsoring the awards since 2020. Thanks to Bruce Horn WA7BNM for putting an annual State QSO Parties Calendar https://www.contestcalendar.com/stateparties.html on his popular contest calendar website, and for facilitating the reporting of state QSO party results to be included in the Challenge on his 3830 website https://www.3830scores.com/

~ Vince VE3YT

A Special Interest Group for the iCOM 7300, 7610, 9700 and compatible models

John Schouten VE7TI
Has both an iCOM 7300 and 9700 and is fascinated by the 'hidden' features of these transceivers.

Understanding iCOM Accessory Connector Signals

iCOM radios come with various accessory connectors to enhance functionality. These connectors allow users to interface with external devices such as amplifiers, antennas, and digital mode interfaces. Over the years, iCOM has standardized the design and function of these accessory connectors, making it easier to connect older equipment to newer radios. This article takes a look at the technical details of iCOM's accessory connectors and signals, and how they can be used to enhance your ham radio experience.

Before diving into the signals, let's examine the evolution of these connectors. I first saw them on my iCOM 706, later on my iCOM 7000 and now on my IC-7300 and 9700. iCOM began standardizing its accessory connectors with the IC 761 model in 1987. Since then, the accessory connectors have largely remained consistent, ensuring backward compatibility with older devices. Initially, the connectors were 7- and 8-pin DIN types.

The 7-pin was typically used for amplifiers or automatic band switches, while the 8-pin was reserved for digital mode interfaces.

In 1995, with the introduction of the IC 706, iCOM merged these into a single 13-pin DIN connector for radios with limited space. Fear not, though! If you still have accessories that use the 7- or 8-pin connectors, iCOM offers a handy Y-cable adapter that splits the 13-pin into female 7- and 8-pin connectors, allowing you to keep your trusty old equipment working.

The Pins

Let's dive into the specific signals available on iCOM accessory connectors and how you might use them. Whether you're planning to power up gadgets or interface with amplifiers, this section will show you how to get the most out of those pins. If you are using the iCOM supplied 13-pin plug and pigtail sold with a new transceiver, I've also included the wire colours.

1. **8V Output** (Pin 1 brown on the 13-pin connector)

   This output is another low-power signal, providing 8 volts, but only up to 10 milliamps. It's primarily a reference voltage for band switching or could be used as a bias voltage for an electret microphone. It's not going to light up your entire station, but for smaller tasks like reference signals, it's perfectly adequate.

2. **Ground** (Pin 2 red)
   Well, this one's obvious, eh? Ground is the reference point for all other signals. Like the mighty groundhog, it doesn't do much, but everything else depends on it.

3. **H Send** ***&*** ***V Send*** *(Pins 3 orange & 7 purple)*

   These signals are used to key external amplifiers or switches when the radio transmits on specific bands.

These signals are going to be different depending on which model iCOM transceiver you have. On the IC-7100 we have both signals H send and V send. On an HF only radio or HF and six meters such as the IC-7300. There's only one signal it's called send and it's on the pin that H sent is on. Radios that have HF and VHF/UHF, the IC-7100, the IC-7000 and perhaps several other models . Any radios that have HF and VHF, UHF will have both of these. They function pretty much identically, but for different bands. Think of these as the radio's way of giving a little nudge to your amplifier when it's time to step in and crank up the signal.

Interestingly, these pins are both input and output signals. When the radio is in receive mode, they output a voltage (around 6.7V), but when you hit the PTT switch, the signal drops to ground, activating whatever device is hooked up to it. You could almost say the radio is playing a game of "Simon Says" with your amplifier.

For radios that don't have both HF and VHF/UHF capabilities, only one send signal will be present.

The band output signals tell external devices, such as antenna tuners or band-switching amplifiers, which band the radio is operating on. This is where things get really interesting if you're automating your station. These signals, combined with the 8V output, help your external devices adjust to the correct band, even when you forget to.

So what is a practical example?

Lets take my IC-7300, or the club's 7610. If you connect the H send line to the ground pin, it keys the transmitter. You could use this for a foot switch for transmit, or maybe if you have a desk mic, instead of pushing the PTT button on it you just connect a foot

switch to these pins. This leaves your hands free for other tasks, like logging in a contest.

4. **BDT and T Key (**Pins 4 yellow & 9 white)

   These are proprietary signals for the iCOM AT-180 tuner and have no standard usage outside of iCOM's own devices. They are listed as "no connection" on some models and aren't part of the standard accessory pin setups found on 7-pin or 8-pin DIN connectors.

5. **Band Signal Output** (Pin 5 green)

   This output provides different voltage levels depending on the radio's operating band. It helps automatically control external devices such as amplifiers or antenna switches. For example, certain amplifiers have a remote control that can use this band output to adjust for the appropriate band automatically. The voltage output ranges from around 0 to 7.46 volts, with each band having its specific voltage. For radios like the IC-7100, an internal modification (soldering a jumper) is required for the band output to work, whereas the IC-7300 and other models handle this without modification.

6. **Automatic Limiter Control ALC** (Pin 6 blue)

   This input is designed for use with external amplifiers. It allows the amplifier to send a negative voltage signal (typically between 0 to -4 volts) to the radio, instructing it to reduce its output power when the amplifier is being overdriven, thereby preventing signal splatter. This ALC connection is standard across radio brands and is crucial for managing high-power amplifiers.

7. **13.8V Output** (Pin 8 gray)

   This pin provides 13.8 volts of power, but only when the radio is powered on. Why is this useful? If you have external devices, such as an amplifier or antenna rotator, you can use this output to automatically power them up when your radio is turned on. You could even wire it up to a relay controlling a 120V outlet or a 12V power strip. Imagine turning on your radio and having your entire shack light up in response—like a ham radio version of a grand entrance!

   However, be cautious. The 13.8V output is only rated for about 1 amp of power. If your accessories demand more juice, using a relay to offload the heavy lifting is the smart move.

8. **FSK Keying FKK (**Pin 10 black)

   This input is used for Frequency Shift Keying (FSK) or Radio Teletype (RTTY) operation. It directly shifts the radio's transmit frequency by a programmable amount (e.g., 170 Hz). This input is rarely used today, as most RTTY operators now use digital software that sends audio tones. However, for those using antique mechanical teletype machines (e.g., ASR 33), this input would allow them to key the radio directly with switch closures or similar mechanisms.

9. **MOD N: Modulation Input** (Pin 11 pink)

   This is the modulation input that connects transmit audio to replace the microphone input. It's useful when using an external mixer with a professional mic or for digital modes. For newer radios like the IC-7100, IC-7300, and IC-7610, you can choose to enable this input via the menu, allowing you to use it for normal or data mode. When using it for digital modes, ensure the mic input is disabled to avoid room noise interference.

   On older radios, such as the IC-706, the mic and modulation input may be used simultaneously, which means you may need to disconnect the mic to avoid interference during digital operations.

10. **AF Detector Output/Audio Frequency Output (**Pin 12 light blue)

    The AF Detector Output provides a line-level audio output, independent of the radio's volume control. This can be extremely useful if you're planning to run the audio to external speakers, a mixer, or an audio interface for digital modes.

In newer ICOM radios like the IC-7100 or IC-7300, this output can be switched between Audio Frequency (AF) and Intermediate Frequency (IF) via a menu setting. If set to AF, it provides the audio signal as you'd expect, while IF mode outputs a wider intermediate frequency signal, which can be used for more advanced applications such as Digital Radio Mondiale (DRM).

Why is this important?

Line-level output: The AF output provides a fixed volume signal that does not fluctuate with the radio's AF gain (volume control). This is helpful if you're running the audio into external equipment where a consistent signal level is needed.

External speakers or mixers: You can connect this output to a set of external speakers or feed it into a mixer, allowing you to combine the audio from multiple radios or amplify the signal without worrying about adjusting the radio's volume.

Digital mode operations: Before USB connections became common in ICOM radios, this AF output was a key way to connect your radio to a sound interface for digital modes. While modern ICOM radios have built-in USB sound cards, older radios still rely on this output for digital modes like PSK31 or FT8.

Squelch Behavior on the AF Output

Interestingly, on some radios like the IC-7100, the AF Detector Output does not follow the squelch setting. This means that even if the squelch is set to block noise from the radio's speaker, the AF output will still send audio, whether the squelch is open or closed. For some operators, especially those using digital modes, this is an advantage because you don't want the squelch to cut out the signal when working with weak transmissions.

However, if you're running the audio into a mixer or speakers and you don't want to listen to static all day, you may prefer the audio to follow the squelch. To address this, some operators have built mute circuits that monitor the SQL-S signal and mute the AF output when the squelch closes. It's a simple modification that can save your ears from constant background noise while monitoring repeaters or weak signals.

Audio Output Variations by Radio Model

Not all radios handle the AF output in the same way. For example, on older models like the IC-706, the AF output is always squelched, following the same behavior as the speaker. On the other hand, some newer models, like the IC-7300 or IC-7610, offer a menu setting that allows you to toggle whether the AF output is squelched or not.

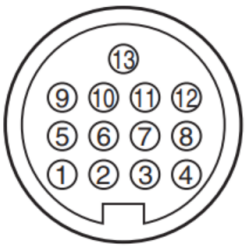
Depending on your radio model, you may need to experiment to see how the AF output behaves with the squelch settings. It's one of those details that may not be fully documented in the manual but can be easily discovered through trial and error.

11. **SQL-S: Squelch Output** (Pin 13 light green) The SQL-S or Squelch Output pin on iCOM radios provides a signal that indicates whether the radio's squelch is open or closed. When the squelch is closed, the signal outputs more than 6 volts, but the current is very low, around 100 microamps. Because of this low current, the SQL-S output is best suited for controlling devices that don't draw much power, like the input on a microcontroller. When the squelch opens, the signal is pulled to ground, dropping to less than 0.3 volts.

What can you do with this signal? Here's where things get fun and practical. You could use this squelch signal to trigger external equipment, such as:

Automatic recording: Start recording as soon as the squelch opens, ensuring you only capture actual transmissions, not static.

Mute circuits: Use the squelch signal to automatically mute the audio when no signal is detected. This can be especially useful if you're running audio to external speakers or a mixer.

ACC	PIN No.	NAME	DESCRIPTION	SPECIFICATIONS
13-pin  Rear panel view ① brown ⑧ gray ② red ⑨ white ③ orange ⑩ black ④ yellow ⑪ pink ⑤ green ⑫ light blue ⑥ blue ⑬ light green ⑦ purple Color refers to the cable strands of the supplied cable.	1	8 V	Regulated 8 V output. (Used as the reference voltage for the band voltage.)	Output voltage: 8 V ±0.3 V Output current: Less than 10 mA
	2	GND	Connects to ground.	—
	3	SEND*1	Input/output pin. An external unit controls the transceiver. When this pin goes to ground, the transceiver transmits.	Input voltage (RX): 2.0 to 20.0 V Input voltage (TX): –0.5 to +0.8 V Current flow: Maximum 20 mA
			Input/output pin. The pin goes low when the transceiver transmits.	Output voltage (TX): Less than 0.1 V Current flow: Maximum 200 mA
	4	BDT	Not used.	—
	5	BAND	Band voltage output. (Varies with the selected amateur band)	Output voltage: 0 to 8.0 V
	6	ALC	ALC voltage input.	Input level: –4 to 0 V Input impedance: More than 3.3 kΩ
	7	NC	—	—
	8	13.8 V	13.8 V output when power is ON.	Output current: Maximum 1 A
	9	TKEY	Not used.	—
	10	FSKK	Controls RTTY keying.	High level: More than 2.4 V Low level: Less than 0.6 V Output current: Less than 2 mA
	11	MOD	Modulator input.	Input impedance: 10 kΩ Input level: 100 mV rms*3
	12	AF/IF (IF=12 kHz)*2	Fixed AF detector or receive IF (12 kHz) signal output.	Output impedance: 4.7 kΩ Output level: 100 ~ 300 mV rms*4
	13	SQL S	Squelch output. Grounded when the squelch opens.	SQL open: Less than 0.3 V/5 mA SQL closed: More than 6.0 V/100 µA

For example, on some setups, this squelch output can be used to mute the audio coming out of the radio when there's no active transmission. This can help reduce the background noise in your shack if you're listening to static for long periods. It's a simple but effective way to make your setup more listener-friendly.

Why It All Matters

Whether you're setting up an antenna switch, amplifier, or digital interface, knowing how these signals work will help you avoid the headaches of mismatched connections and underpowered gadgets. And since the signals on these accessory connectors haven't changed much in 30 years, you can take comfort in knowing that your shiny new iCOM will still play nice with your retro gear.

An Example: The "Automatic Everything" Ham Shack

Let's put this knowledge into a practical example. Imagine setting up your shack so that when you turn on your iCOM radio, it automatically powers up:

- Amplifiers (keyed via the H Send or V Send signal

- Antenna switches (adjusted based on the band output
- Digital interfaces (ready to decode your PSK31 signals)
- A glowing “On Air” sign (powered via the 13.8V output
- You could even use the 8V output to power an old-school analog clock, ensuring you never miss a contest’s start time.

iCOM's accessory connectors offer incredible versatility for hams who love to tinker and automate their stations. Whether you're powering amplifiers, band-switching antennas, or simply lighting up a gloriously unnecessary "On Air" sign, understanding how these signals work is key to making the most out of your radio setup.

So, the next time you’re elbow-deep in DIN cables and signal diagrams, just remember: You’re not just connecting devices—you’re engineering the ultimate ham radio experience.

~

iCOM IC-7610 review and full walk-through

by PASCAL VA2PV

At SARC we have the excellent iCOM IC-7610, a high-end dual HF radio using SDR technology, as one of our training centre transceivers. I found an excellent overview on YouTube that describes the features of the 7610 and provides some practical tips. This is an excellent introduction for new members and those looking toi start contesting at the OTC.

Here is the link to the video (or click on the graphic): https://youtu.be/SWcjoGkaYhM

~ Pascal

Do you give an accurate signal report?

It is important to distinguish between an ‘S’ meter reading and readability

by CHRIS TURNER ZS6GM

When another amateur station asks you to give a detailed signal report, or an audio report are you able to be objective? This is particularly important when the operator is testing microphones or the setup of a radio.

When giving a signal report, it is important to distinguish between an ‘S’ meter reading and the readability or understandability of the other station’s signal. Signal strength alone does not determine how understandable the station’s transmissions, because there are other factors which determine the understandability of a transmission. These include audio response, compression and distortion.

The goal of any amateur station is to be heard and understood, particularly under difficult communications situations. So, when providing a signal report try to address the main factors that affect understandability.

Audio Response

Does the voice sound balanced or natural? Remember that the more natural a voice sounds the better will be the intelligibility. The frequency spectrum of the human voice is complex and if too tailored or restricted you can affect the ability for the operator at the other end to understand what is being said.

The audio response of the radio system from microphone to RF output should, in the first instance, accurately reflect the voice of the operator. Additional effects can then be added to boost the high frequency response or cut low frequency response to improve the intelligibility.

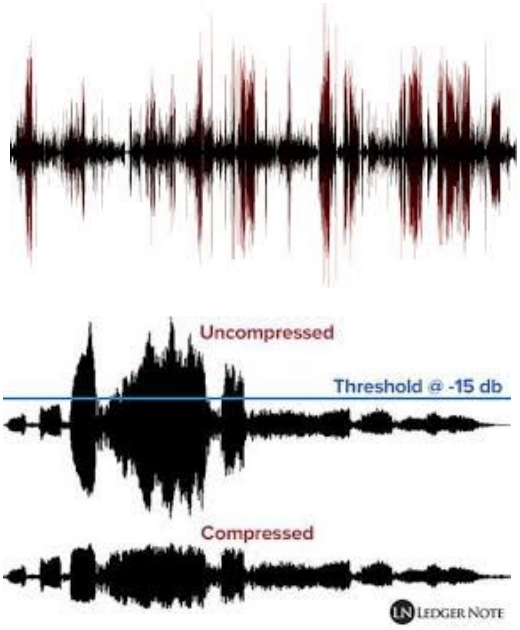
The operator’s voice plays a big role in the setup of a transmitter. A setup that works for one person will most certainly not work optimally for another.

When reporting try to answer these questions.

- Does the voice sound natural?
- Are the higher frequency components crisp, clear and sharp or are they 'muddy' or indistinct
- Are the low frequencies dominant or overpowering?
- Is there any harshness? Compression and Distortion can affect not only the balance of the sound but also the intelligibility.

Compression

Compression is a means to reduce the dynamic range of an audio signal thereby increasing the average power in the signal. In the professional radio broadcasting world, this is known as density, because when you look at the compressed signal the picture appears denser. Applying too much compression causes third order intermodulation distortion which actually detracts from the intelligibility of the overall sound. Applying just the right amount of compression gives the audio a fuller sound without introducing distortion and has a similar effect to increasing the transmitter power output.



If there are too many low frequency components, compression will tend to cause the low frequency intermodulation components to dominate detracting from the overall understandability. This is why when setting up a compressor, one should high pass filter the audio before compressing. In other words, the low frequencies should be rolled off. A good cutoff point for SSB communications is 300 Hz.

When reporting, try to answer these questions.

- Is the audio clean or is there harshness?
- Compression should be introduced to the point where the operator's voice sounds fuller and louder without introducing 'breathlessness' or heavy breathing, or lots of echo or room background noise.
- Have the operator gradually increase compression until distortion or harshness become evident and then back off slightly.

Distortion

Distortion of the audio in a transmission can be caused by many factors. However, the most common are -

- Non-linearity in the transmitter chain and usually in the power amplifier caused by incorrect or faulty biasing,
- Over-driving a linear amplifier
- Applying too much compression,
- RF feedback between the radiated signal and the audio input circuits and/or microphone.

Non-linearity can be fairly easily identified because the signal will break up on softer audio and become clearer as the gain is increased. With listening practice, the effect is quite easy

to identify. Non-linearity can also be detected by how broad or how much bandwidth is occupied, in other words 'spreading' or spitting and spluttering sounds when listened to on adjacent frequencies.

Over compression usually manifests as harshness in the sound of the voice and a loss in naturalness as well as intrusive background noise.

RF feedback to a trained ear will be quite distinctive but similar to non-linearity. In the worst cases it causes squealing or howling on higher modulation peaks.

A well-adjusted and properly performing transmitter will sound clean and natural with a nice fullness to the voice without introducing distortion or harshness. When giving a signal report use these guidelines to help you describe the other's audio / transmission.

~ Chris ZS6GM

Reprinted courtesy of the South Africa Radio League

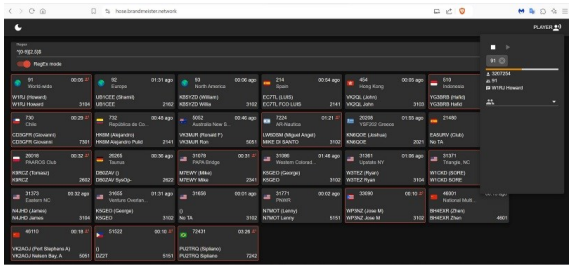
E-mail: radiozs@sarl.org.za

Web: www.sarl.org.za

The R-S-T System

See this month's Back to basics column for a review of Readability, strength and Tone

Droidstar



At the request of a Japanese radio amateur, I made two videos, because Rohith Namboothiri VU3LVO, continuous to develop the previously abandoned DroidStar, for both iOS and Android,

- I made a 1 minute comparison between the audio introduced with the microphone into DroidStar (set at studio quality) and what I hear back on the DMR Hoseline. I take advantage of the one second delay. https://youtu.be/ihAeA0i8clg
- I have a 7 minutes video with a QSO, complete with hunting on the DMR hoseline, talking and completing the logbook. https://www.youtube.com/watch?v=oGs8l0_gyrw

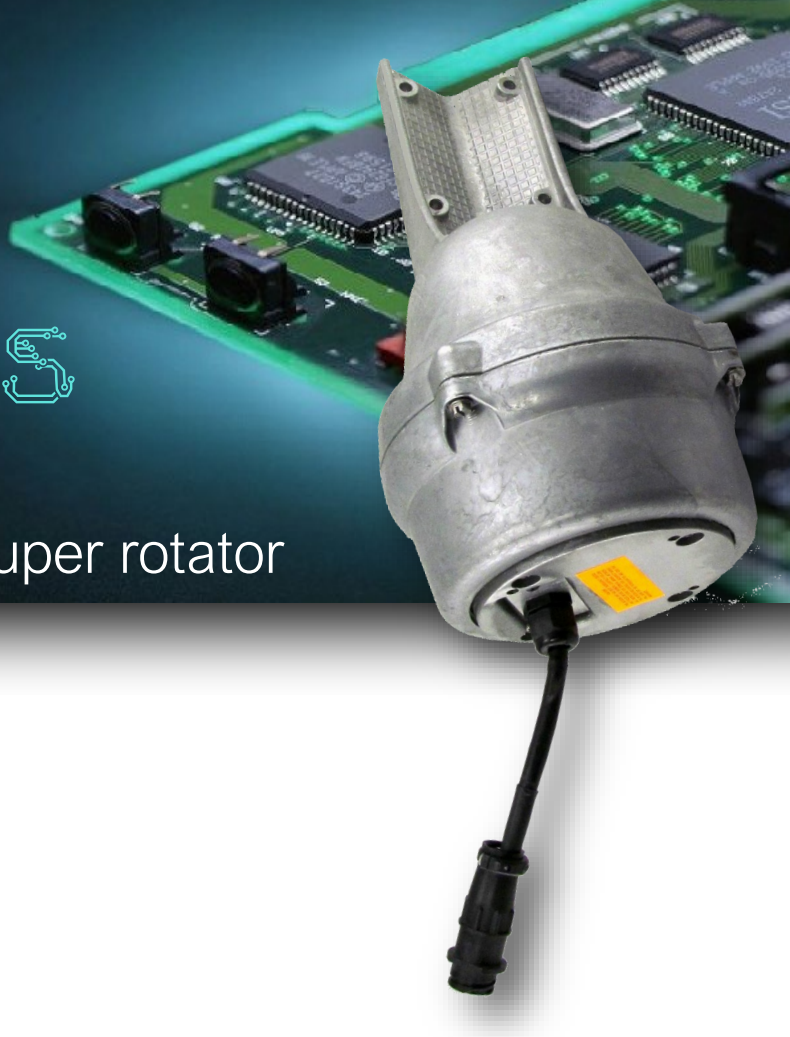
This is how I work, as I do not have any hardware whatsoever. I used a screen recorder for my Windows 11 computer. I recorded the microphone too, because I provided some explanations. I never hear my own microphone, because I press the "MUTE" button, to cut the sound while I transmit. I spend no money on ham radio, and I use it exclusively as a chat, to practice foreign languages.

I use DroidStar on an Android 12 virtual machine (MuMu Player 12). I listen to the DMR Hoseline page directly into the DMR hoseline, no degradation in the hotspot, no loss of packages in the radio. (The Windows version of DroidStar, called DudeStar, has some problems.)

DroidStar can be downloaded here. The blurb and last release (not working on M17) is at: https://github.com/rohithzmoi/Droidstar-DMR

VU3LVO botched M17 mode on its last version 8, but he is fixing it. I exchanged emails with the guys from M17, and they have no intention to make a similar page for M17, as exists for DMR Hoseline.

~ Daniel VE7LCG



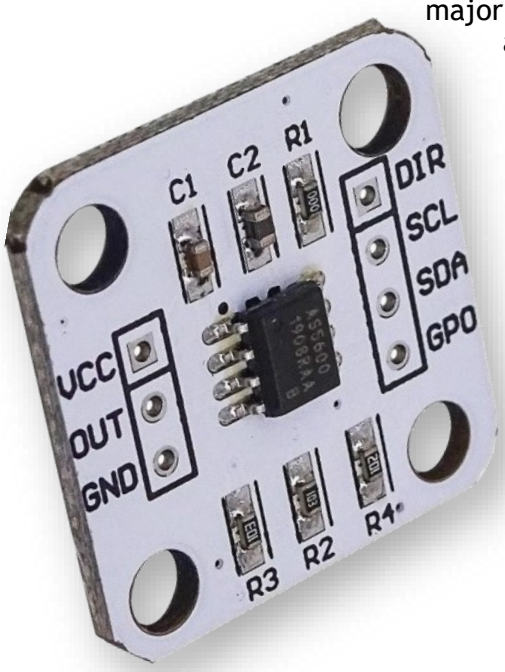
TECH TOPICS

Converting a Ham-IV into a super rotator

by MAT ERASMUS ZS6PEG

I would like to show you how I have converted my Ham-IV rotator into a super rotator, and why.

Modern amateur rotators suffer from two major drawbacks. If you are an active radio amateur, serious about HF DX or satellite tracking you will know all about this. Of course, that is if you can afford the extravagant prices of a new rotator. Rebuilding old rotators takes time, parts are expensive and hard to find, but in the end, the drawbacks are inherited.



Cutting edge technology has finally come to our rescue. Costs are minimal as such, justifying a bit of 'tinkering.'

The first drawback of rotators. Even the very expensive and complex azimuth and elevation models have limited movement range. This is due to the angle detectors. The most reliable detectors are rather simple potentiometers. Authors note. I have added some thoughts and info from practical tests at the end.

The second drawback is reading accuracy across the motion range. This becomes obvious when we use computers and/or micro controllers for automation.

Osram has come to our and countless other applications rescue. The AS5600 is a tiny microchip. It uses advanced processing to convert a special and equally tiny, rotating magnetic field into an endless and very accurate direction sensor.

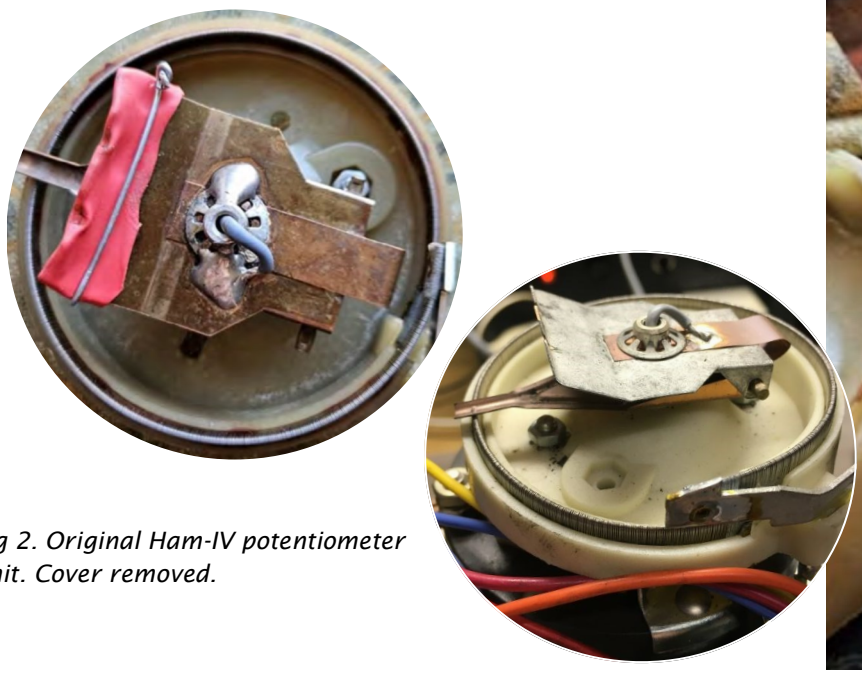


Fig 2. Original Ham-IV potentiometer unit. Cover removed.

Fig 3. Potentiometer unit slider mod.

Pre-mounted modules are available for the likes of me, who can hardly see the chip. The cost is affordable, to the point where the effort to make complex modifications is justified.

From here onwards, I will be showing you, step by step, how to convert your Ham-IV rotator into a super accurate and range-less super rotator using 7 instead of 8 control wires.

I will call this upgrade the 'Ham-IV super'

The conical spacing under the potentiometer unit is an ideal place to mount the magnet and AS5600 module. To use this space, I have had to modify the potentiometer unit quite a bit.

Six tasks are required to complete this modification.

1. Prepare the potentiometer unit
2. Mount the AS5600 module
3. Remove the Ham-IV end stops
4. Fit a 5-volt regulator and capacitors
5. Wiring
6. Testing

Task One - Prepare the potentiometer unit

Step 1. Remove the potentiometer unit. Ignore the red insulator and wire strap. This was a previous attempt to isolate the potentiometer from earth.

Step 2. Remove the slider mechanism from the potentiometer unit. Carefully remove the O ring from the bottom of the potentiometer unit.

Step 3. Cut off the slider pointer (with a side cutter) about 15 mm from the end. Bend the remaining pointer part as shown. This will ensure that there is still spring tension on the rotating unit.

Step 4. Remove the wire wound unit. Note the smaller connector is bent to keep it in place. Straighten that first. *[Figure 4]*

Fig 4. Wire wound unit with connector tags.

Step 5. We need to shorten the slider unit shaft. Firstly, to mount the magnet at the bottom. But also, to

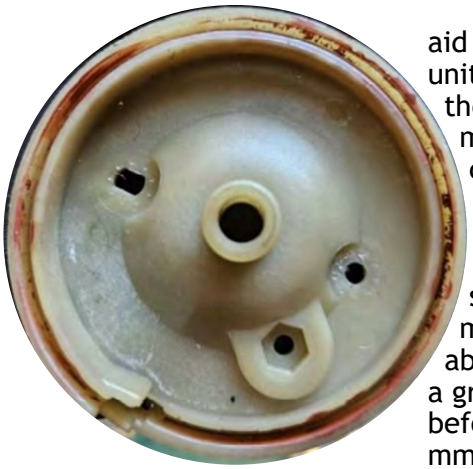


Fig 5. Middle

Fig 6. Potentiometer unit shaft, before shortening

Fig 7. Bush extension after shortening

aid in lifting the potentiometer unit by about 3,5 mm. (So that there is enough room for the motor.) Some of this space can be recovered by shortening the plastic bush housing a bit as well. The shaft length after shortening should be 8,5 mm. And the bush extension about 4 mm. Use a hacksaw to cut a grove in the shaft (as it was before) to hold the circlip, about 1 mm from the end. Note: All edges must be perfectly flat, so that the magnet will turn uniformly.

Step 6. Remove the outside section of the plastic that held the wire wound unit.

Step 7. Ream the top of the two mounting holes with an 8 mm drill to the depth of 2.5 mm *[Figure 10]*.

Step 8. Re assemble the sensor rotating unit with its O ring.

Task Two - Mount the AS5600 module

Step 9. Before fitting of the AS5600 module the programming resistor R4 must be removed.

Remove the GPO pin resistor R4 from the module by cutting it with a sharp side cutter *[Figure 13]*. Some modules might not have this resistor. This resistor is connected to ground to put the AS5600 into programming mode B. Do NOT program this chip.

Step 10. Mounting support for the AS5600 module. Cut a piece of clear firm plastic from a cheap container. Use a sharp pointed soldering iron to make holes as shown in Figure 14. Note that the AS5600 chip must be centred to the magnet. The magnet may be from 0.5 mm to a maximum of 3 mm away from the chip.

Fig 8. Cut away the excess plastic

Fig 9. Discard excess plastic.

Fig 10. Ream the top of the two mounting holes for the original studs to be re-used.

The bottom hole can be used to secure the module mounting support with a small 3 mm machine screw and nut. Note that the top two holes have been extended through the base unit, with the soldering iron. Here I have used thin twisted wire through these two holes for a tie (twisting to tighten on top). You can also use very small tie wraps or similar. The inner holes are for securing the AS5600 module in place. Here again I have used thin twisted wire, tightened from the top of the module and positioned away from surrounding obstructions. Once again, you might choose alternate ties.

Note that the three terminating wires of the module are oriented towards the bigger hole where the wire wound unit was fitted *(bottom right)*.

On the next page is a sketch of the sizes of my prototype 'plate.' This might or might not be helpful.

Step 11. Testing. Connect 5V and observe the output voltage change from 0 V to 5V as the top rotating unit is turned.

At this stage you have converted the Ham-IV potentiometer unit to a very accurate (0.1 degree) angle sensor.

Step 12. Install the modified potentiometer unit back onto the Ham-IV rotator. A 5 mm nut can be used to make a 3.5 mm spacer for the two pressed stand-off studs. Additionally, I have made a crude stand-off fitted for stability's sake. See figure 17 *[next page]* for a close-up photo.

Fig 11. Sensor rotating unit fitted. The little magnet will be mounted, dead centre of the shaft. The magnet must lie as flat as possible. Movement should be non-oval. Ensure the rotating unit turns relatively easily under its spring tension.

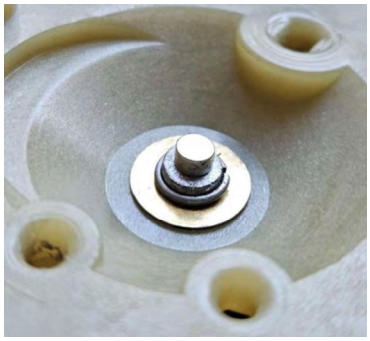


fig 12. Once you are ready to mount the sensor magnet, this is how it should fit. I have glued the magnet, shaft, 0 ring and copper washer with super glue.

Task Three - Remove the Ham-IV end stops

Step 13. For endless rotation. Remove the two long spring contacts and cut the orange and yellow wires. See figure 18, *[next page]*.

Step 14. Remove the contact actuating armature.

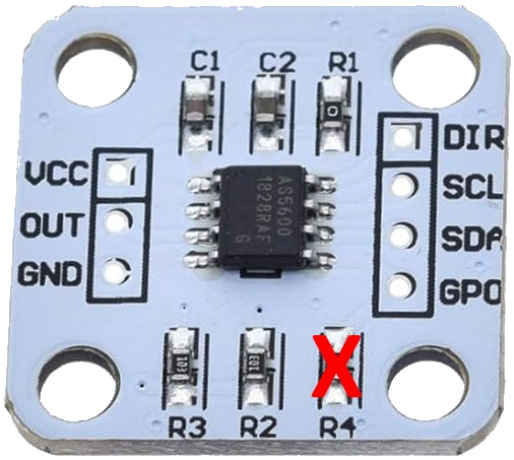


Fig 13. Remove GPO resistor

Task Four - Fit a 5-volt regulator and capacitors

Step 15. If your controller supplies 12 volts regulated to the potentiometer, you will need to install a 5-volt regulator like the LM7805. Use a mica insulation kit. Also, let us add two 200 uF electrolytic capacitors to the 12-V supply. And 220 uF to the 5-V side. For induced motor and brake noise limiting.

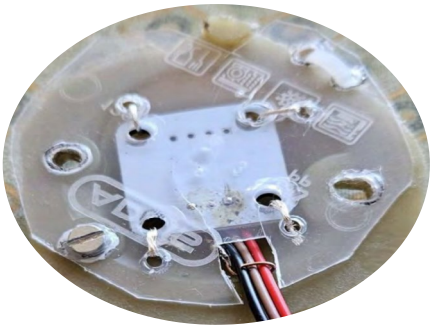


Fig 14. Mounting support for the AS5600 module

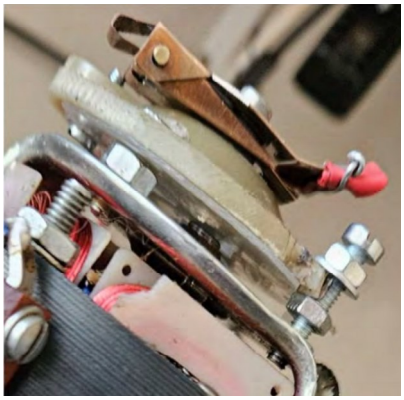


Fig 16. Mounting support. A 4mm machine screw 20mm long. Three 4mm nuts.

Fig 17. I have used a 5mm nut as a 3.5mm spacer for the two pressed stand-off stud screws. The original nut only screws in half way but is tight.

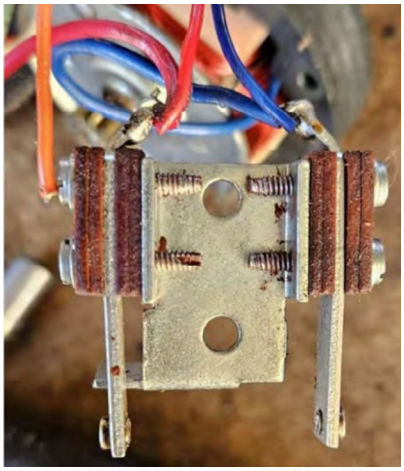


Fig 18. [left] End stop switches removed

Task Five - Wiring

Step 16. Use one of the cut wires, yellow or orange to carry the sense voltage back to the controller side. The 0 volt (0 degree) to 5 volt (359 degree) OUT control voltage will not drive the controller meter correctly, without further processing.

The two wires used for the big AC capacitor are now used, also, to turn the rotator. Strap connectors numbered 4 and 6 (turn left or ccw). Also strap connectors numbered 5 and 8 (turn right or cw) on the controller connector.

Task Six - Testing.

Step 17. Test the movement and output voltage of the new rotational sensor, before assembling the Ham-IV.

Thoughts and info from practical testing

I have realized that the orientation of the magnet is very important for a perfect measurement result. Perhaps I will consider using a small bearing as the plastic housing tends to distort the movement a bit.

One could attach the magnet directly to the top bell housing with a rod centred at the top.

Fig 19. End stop armature

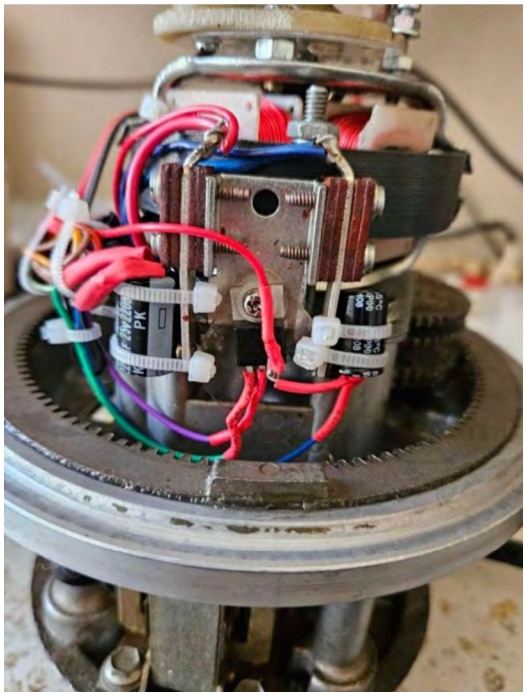


Fig 20. 5 volt regulator

Fig 21. [right] Ham-IV controller straps to turn rotator endlessly

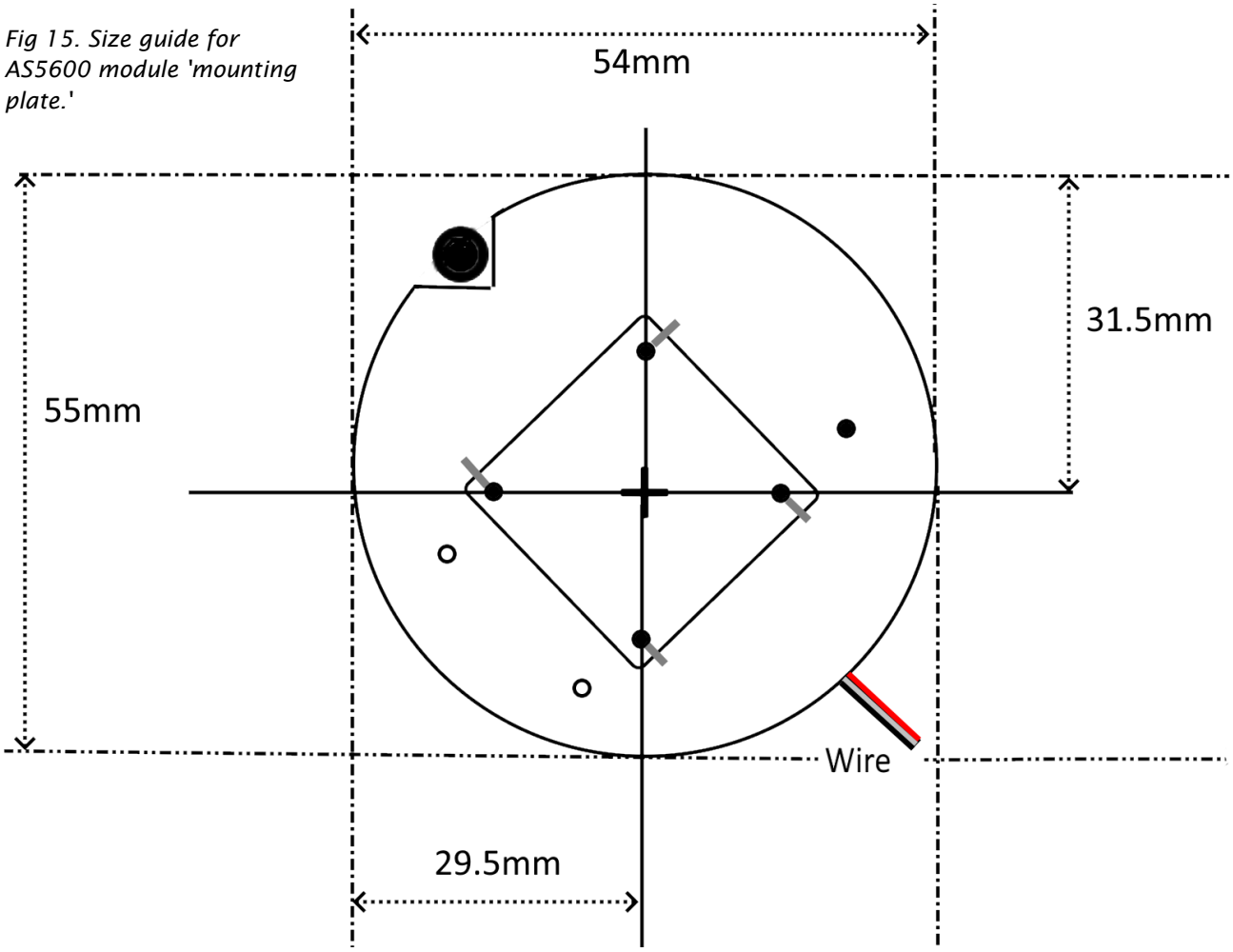


Fig 15. Size guide for AS5600 module 'mounting plate.'

Nonetheless the results of my prototype are not bad at all. I will work next on the Arduino controller. If you are interested, check with me, for Arduino software, etc.

Having just connected the OUT line to an Arduino using a 16-bit ADS1115 ADC, the results look very promising with about 1 degree accuracy without any compensation software. Not bad at all for a rotator designed for a 2-degree error and in practice up to 5+ degrees at some parts.

I would love to hear from you, if you try this, or apply the idea to a rotator. Any comments or suggestions are most welcome. My e-mail address is zs6peg@gmail.com.

~ Mat ZS6PEG

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E-mail: radiozs@sarl.org.za

Web: www.sarl.org.za

Will news of exploding transceivers impact our hobby or will they affect the supply?

Washington Post —

Icom IC-V82 handheld transceivers designed for amateur radio use have been identified as the latest device to deliver deadly explosions targeting members of Hezbollah.

The identification of Icom radios follows an initial attack on members of Hezbollah in which pager devices were used to deliver deadly explosions. Icom is investigating the reports of its radios being used in these attacks while Icom sales reps believe the radios identified are knock-offs. Icom is expected to release its findings on its website. The IC-V82 was discontinued in 2014.

The deadly attack that caused radio transceivers used by members of Hezbollah to explode Tuesday shines a spotlight on an inconvenient truth: It is virtually impossible to secure the modern electronics supply chain against a determined and sophisticated adversary.

The source of Wednesday's explosions was not immediately clear. Lebanon's state news agency said some of the explosions occurred in a brand of two-way radio, with images from the scenes of the explosions showing walkie-talkies bearing the brand name Icom and the model number V82.

Icom, a Japanese manufacturer of radio equipment, said in a statement on its website Thursday morning that it produced the IC-V82 handheld radio from 2004 to October 2014 and shipped it to overseas markets, including in the Middle East, during that period. But there had been no shipments since the model was discontinued about 10 years ago and the production of batteries to operate the unit had also been discontinued, the company said.

Furthermore, the photos of the devices did not show the hologram sticker that Icom had attached to the units to prevent counterfeiting, "so we cannot confirm whether the product was shipped from our company or not," the statement said. Experts call the Israeli attack unparalleled in the history of spy craft in its scale and casualty count, and believe the risk is low that other governments will follow suit in rigging consumer electronics this way. But the Lebanon attack brings to life a long-theorized, worst-case scenario that has troubled governments including the United States as electronic devices have grown more complex and global supply chains more convoluted.

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… and the there were pagers

Built for rough terrain, with a battery that lasts half a year without recharging, unfollowable by the Israeli secret service and also water resistant. Those were the main arguments for Hezbollah to buy five thousand pagers for their followers.

The consequences on September 17, when the Israeli secret service Mossad pressed the remote control and the Hezbollah pagers went off, were disastrous for the terrorist organisation.

But what they didn't know was that a mechanism was built in that would lead to maximum damage to the owners. The heavily secured pager always first gave the message 'you have received a secure message'. To unlock that, you had to control the device with two hands. And at that moment it was explosive.

The consequences on September 17, when the Israeli secret service Mossad pressed the remote control, were disastrous for the terrorist organisation. There were an estimated three thousand victims. Most seriously injured, but there were also many deaths. Hezbollah's middle management was immediately largely eliminated.

The AR924 beeper, or pager, was the most ingenious mini-bomb ever produced in large numbers, a reconstruction by The Washington Post can be concluded. The newspaper spoke with multiple sources in Israel, the Arab world including Hezbollah and within the security services of America.

These interviews show that Israel had already started operation 'squeaper' a year before the invasion by Hamas on October 7, 2023. The Mossad saw that Hezbollah was quickly arming with precision bombs thanks to Iran's support and decided that something had to be done. Tapping Hezbollah's phones also became increasingly difficult because the terrorist group was switching to a new communication network.

The secret service had previously experimented with explosive materials in portable devices. The very first plan to provide walkie-talkies widely used by terrorists with explosives, for example, dated back to 2015. The devices, with huge batteries, had enough space to mess with. Israel had years to further refine the plans for the semaphones.

Israel worked with intermediaries

Hezbollah was, of course, extremely cautious. Israel had to work with intermediaries so as not to arouse suspicion. Eventually, a woman who first worked for the Taiwanese traffic light manufacturer Apollo was deployed as an intermediary. She closed the deal for the purchase of five thousand beeps. The representative convinced Hezbollah that a special model with a slightly larger battery was much more suitable for the terrorist group.

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By JAN PA2P

During November 2024, members of Radio Club Limburg, in the North Limburg region of The Netherlands will activate Special Event Station PF16F. PF16F is a special event station to bid farewell to the F-16 fighter aircraft also known as the Fighting Falcon.

After 45 years of service - from 1979 to 2024 - the F-16 will retire from the Royal Netherlands Air Force (RNLAF).

Members of Radio Club Limburg will activate the callsign PF16F from November 1 to 30, 2024 and work as many amateur radio operators as possible around the world.

Whether you are an amateur radio operator hoping to contact a new country, a new callsign or you are a casual visitor, we welcome you to our website: https://rclb.nl/pf16f

We hope to hear and work you in November 2024.

On behalf of the PF16F team,

~ Jan PA2P

mookseberg@kpnmail.nl

Understanding Compliance:

A deep dive into transceiver testing

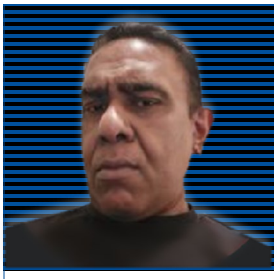
By JOHN SCHOUTEN VE7TI

In the world of amateur radio, it is vital for operators to ensure that their equipment meets industry standards for spurious emissions and regulatory compliance. With a focus on the Canadian radio community, Reg Natarajan VA7ZEB's Advanced Amateur's "Radio Compliance Tests" page serves as a robust resource that provides detailed compliance test results for a wide array of popular transceiver models. The purpose of these tests is to assess whether handheld and mobile radios conform to International Telecommunication Union (ITU) standards, particularly those related to unwanted emissions and interference.

The importance of these tests cannot be overstated, especially when considering that improper transceiver equipment can cause unwanted interference with other communications or services, such as aviation, marine, and public safety frequencies. For Canadian amateur radio enthusiasts, adhering to these standards is not only a matter of best practice but also a legal requirement under the Radiocommunication Act and Canadian regulations set forth by Innovation, Science and Economic Development (ISED) Canada.

Understanding Spurious Emissions and Compliance Standards
One of the key metrics in compliance testing is the measurement of spurious emissions. These are unwanted signals emitted by a transmitter that can interfere with communications on nearby frequencies. According to the ITU, which oversees global spectrum management, spurious emissions must be kept below a certain threshold to prevent interference. This is where Advanced Amateur's tests come into play.

The tests conducted by Reg focus on determining whether popular transceiver brands comply with ITU guidelines on spurious emissions, a crucial factor in determining the quality and safety of the transceiver. Radios that fail to meet these standards risk not only causing interference with other users but also potentially violating national and international regulations.



A nod here to Reg VA7ZEB for his on-going transceiver compliance testing and website.

Baofeng UV-82

Icom IC-V86

Icom IC-32AT (1988)

Jianpai 8800

Icom IC-92AD

Kenwood TH-D74

Comparative Analysis: Baofeng, Icom, Kenwood, and Yaesu

To better understand how radios perform under these compliance tests, let's take a closer look at several popular models reviewed on the website. These include models from well-known brands such as Baofeng, Icom, Kenwood, Quansheng, and Yaesu, but also brands less common.

Baofeng

Baofeng became a widely popular brand among amateur radio operators, mainly because of its affordability. However, one of the frequently mentioned issues associated with Baofeng models, particularly the UV-5R, is their failure to meet spurious emission limits. In the tests conducted by Advanced Amateur, Baofeng radios were surprisingly clean.

Icom

Icom is known for producing high-quality amateur transceiver equipment, and it shows in their compliance testing results. Unlike poorly designed brands, Icom radios typically meet or exceed ITU standards for spurious emissions, making them a reliable choice for operators who need a compliant and interference-free device.

A prime example is the Icom V-86, which was tested on Advanced Amateur and found to exhibit no spurious emissions. The V-86's superior filtering capabilities ensure that it adheres to the strict standards set by ISED Canada, providing peace of mind for users who want to avoid interference with neighbouring frequencies. The results show that while Icom radios may come at a higher price point, they are a worthwhile investment for those seeking both performance and compliance. With robust performance in emission testing, iCom equipment offer an attractive option for operators looking to ensure compliance without compromising on advanced features.

Jianpai

Here is a brand that has recently gained a following because of its colour dual band display and tri-band capability. But unfortunately, testing revealed that these transceivers often emitted signals far beyond the allowed limits, which could interfere with other bands, including aviation or public safety channels.

For example, the Jianpai 8800 was found to produce significant spurious emissions in bands outside the designated amateur radio frequencies, failing to meet ITU requirements. This puts users at risk of violating radio spectrum regulations, which could result in fines or penalties. Although these radios are mid-pried at around C$100 and therefore budget-friendly, their non-compliance with emission standards suggests they may not be ideal for operators concerned about following the rules and avoiding interference.

Kenwood

Kenwood is another reputable brand in the amateur radio community, with its products also performing well in compliance testing. The Kenwood TH-D74, for example, showed excellent results on Advanced Amateur's tests, indicating that it emits spurious signals well below the required thresholds.

Kenwood's radios are often praised for their high-quality construction and consistent performance across various bands. The compliance tests further affirm this, demonstrating that Kenwood radios are ideal for amateur radio operators in Canada who need reliable, rule-abiding equipment. The Kenwood TH-D74 is a particular favourite among those who require both amateur and professional performance in their rigs.

Baofeng UV-5R (Certifie

Baofeng UV-5RM

Radtel RT-490

Wouxun KG-UVD1P

Yaesu VX6

Telkpod A36 Plus

Yaesu FT5D

Icom IC-T10

Quansheng UV-K5(8)

Abbree AR-869

Baofeng UV-5R (Uncertified)

Baofeng UV-17 Pro GPS

Baofeng UV-5R (FCC Version)

Quansheng

A brand that has skyrocketed to popularity in the past year, Quansheng's UV-8K5 is one of the hottest sellers for a sub $50 handheld. One of the features that makes these transceivers so pupuklar is USB-C charging and the ease with which the firmware can ge changed. There are dozens of YouTube videos demonstrating firmware upgrades to include some HF coverage as well as single sideband.

A big surprise in testing was that these are remarkably clean transceivers with negligible

Yaesu

Yaesu is another brand known for manufacturing radios with excellent compliance to emission standards. The Yaesu FT-70DR, a versatile VHF/UHF band transceiver, was found to have minimal spurious emissions in Advanced Amateur's tests, similar to Icom and Kenwood models. Also tested and found compliant, the FT-65 is particularly popular among operators who require a wide range of functionality.

The Importance of Compliance for Amateur Radio Operators

For amateur radio operators, adhering to radio compliance standards is crucial not only to ensure good operating practice but also to remain within the bounds of the law. Failure to comply with spurious emission standards could result in hefty fines or legal actions by ISED Canada. Furthermore, non-compliant radios have the potential to cause interference to critical communication systems, such as those used by emergency services, which can have serious consequences.

By using Advanced Amateur's detailed test results, operators can make informed decisions about their transceiver purchases. The website provides a valuable service by testing popular transceiver models and comparing their compliance to international standards, ensuring that operators can choose equipment that meets their needs while staying within regulatory limits.

The "Radio Compliance Tests" section on Advanced Amateur's website is an essential tool for Canadian amateur radio operators. By offering detailed insights into the spurious emissions and compliance of radios from brands like Baofeng, Icom, Kenwood, and Yaesu, the site helps users navigate the complex landscape of radio equipment regulation. For operators looking to stay compliant with ITU and Canadian standards, this resource is invaluable.

Whether you are considering a budget-friendly Baofeng or a high-end Icom or Kenwood transceiver, understanding how your equipment performs in terms of spurious emissions is key to responsible and legal operation. Advanced Amateur's testing results provide the necessary data to help operators avoid potential interference and regulatory issues, promoting a safer and more compliant amateur radio community.

For those interested in learning more about the compliance of specific transceiver models, Advanced Amateur's website is a must-visit. With the information provided, you can ensure your equipment not only performs well but also meets the required standards, allowing you to enjoy amateur transceiver while staying within the bounds of the law.

https://www.advancedamateur.ca/radio-compliance-tests

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TIDRADIO TD-DP738

Yaesu FT-70DR

TIDRADIO TD-H3

Yaesu FT65

Amateur Radio RF Test Equipment 2025

Some alternative RF equipment purchase strategies

by DON WESTACOTT VE6HQ

Don has pursued a lifelong interest in science and engineering beginning as a youth in western Canada. He received his first amateur radio license at the age of 15 while attending high school in Edmonton, Alberta, Canada.

I read with great interest the technical article "Test Equipment and an Easy CW Decoder Project" by Kevin McQuiggin, VE7ZD/KN7Q. The article, published in The Communicator, May-June 2024 edition described radio frequency test equipment, principally a Spectrum Analyzer and RF Signal Generator. The author presented an excellent review of advanced RF instrumentation and its application within our amateur radio community.

The VE7ZD article suggested

"As for cost, it is a fact that brand new, state of the art test equipment can be very (very!) expensive. Used equipment, however, is readily available if you know where and how to look for it and may be purchased at a fraction of the cost"

The article also stated *"Purchase price for a high-quality used signal generators in working condition, with reasonable frequency coverage and recent factory calibration will probably be in the range of $1K to $1.5K. Similar quality spectrum analyzers will be about $1.5K to $2K. Obviously, this is a significant cost, but this option is always there if you don't have any academic or corporate contacts."*

After reading this excellent article, I developed a number of concerns and have taken the opportunity to document them and importantly suggest possible alternative RF equipment purchase strategies that may be helpful.

Disclaimer:

The information provided about hardware or software products does not imply any financial association or sponsorship. We do not endorse or have any financial interests in the products mentioned. Our reviews and opinions are based on independent analysis and research to provide informative content to our audience. It's important to make your purchasing decisions based on your own research and needs.

My principal areas of concern include:

Economic Costs

An internet search confirmed the $ 3K plus price tag for the Spectrum Analyzer - RF Signal Generator combination. In general, purchase of used equipment does impose some risk for operational status and accuracy of the unit.

Test Measurement Equipment Utilization

Directly associated with the economic cost is a second term I describe as “cost of ownership”. RF test equipment is commonly used sporadically in the typical amateur radio operation. The ratio cost / utilization places additional stress in our equipment purchases decision process.

Obsolescence

The so called “legacy” equipment may present additional technical challenges. Component or equipment failure rate tends to increase with age. In general, replacement parts and equipment repairs are expensive. Calibration of the equipment may require additional equipment that adds complexity and associated expense.

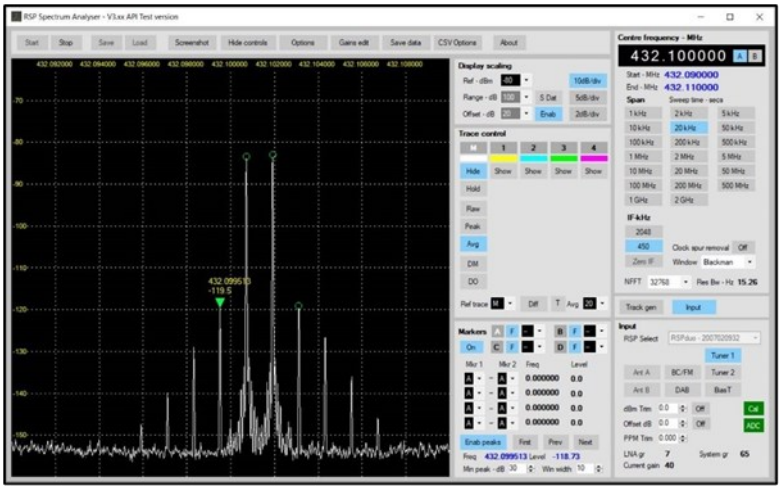
Path Forward

Significant technology advancement has occurred since I first entered the amateur radio community 57 years ago. Introduction of digital signal processing, low-cost computers that exhibit extraordinary computational power plus graphical presentation of data and solid-state integrated RF devices “chips” have changed the landscape of our amateur radio operations. This article explores additional and current hardware and software combinations that provide “fit for purpose” RF Test Equipment and significantly lower cost for entry.

Spectrum Analysis

The introduction of Software Defined Radio (SDR) technology is widely adopted within amateur radio. Importantly, this technology provides the hardware building blocks for a high-quality Spectrum Analyzer.

In this example, a SDRplay RSPdx (purchase price ~ $300 CDN), RSP Spectrum Analyzer software (Andrew Developments, available for free download) and a Windows 10 PC computer are combined to yield a functional RF spectrum analyzer.



The illustration depicts intermodulation distortion (IMD) measurements for a 70 cm amplifier I had constructed.

This hardware – software combinations provide frequency coverage from 1KHz to 2 GHz

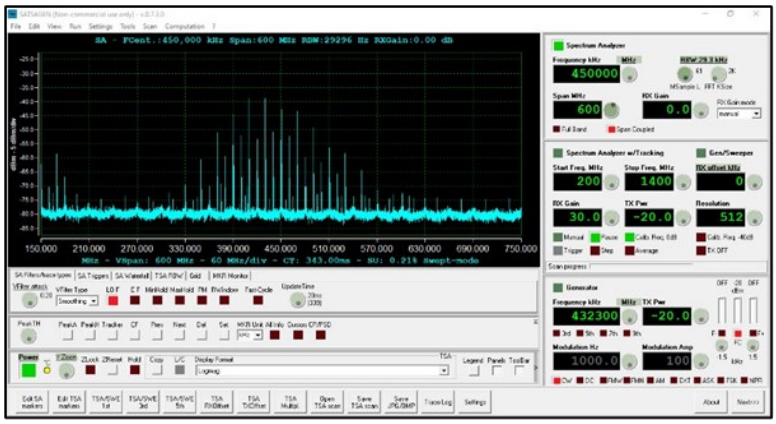
A wide range of signal processing functionality is included within the software that I would suggest rivals many higher priced commercial models. Since we are using software and a computer to process and display the spectral data, we may resize the display to our entire screen size (or multiple monitors). This is a significant advantage compared to traditional spectrum analyzer having a screen size of 9 inches or less. In addition, results of analysis may be saved to a computer file providing the ability to catalog measurements and refer to prior test results. Since we are controlling the hardware through a computer, the SDR radio / spectrum analyzer may be controlled remotely.

To address the challenge/concern of equipment utilization, it is noted that this SDR device is a broadband receiver (1KHz to 2 GHz) and when combined with a range of available software may provide an excellent secondary or even primary receiver system in your daily amateur radio operations.

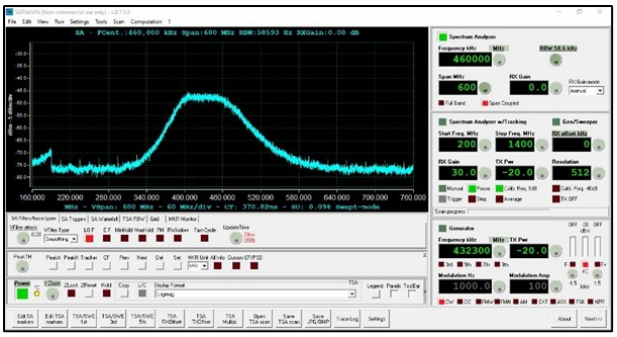
A second SDR is the Pluto Plus (purchase price ~ $450 CDN) is described. This SDR transceiver provides 2 independent receivers (Rx) and two independent transmitters (Tx) within a compact metal encased package.

The Pluto+ SDR may be computer controlled through PC software. Importantly this SDR device may be programmed either as a Spectrum Analyzer, RF Signal Generator or Spectrum Analyzer plus Tracking Generator.

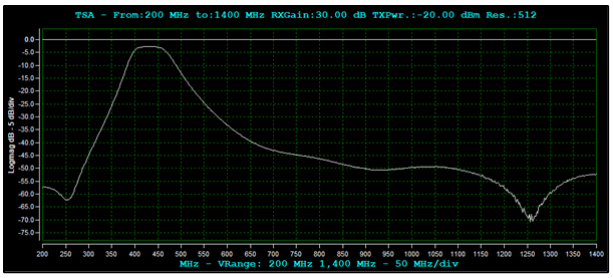
In this example, the OCXO 10 MHz square wave fundamental frequency is inspected after passing through the 70 cm bandpass RF frequency filter.



Alternatively, a low-cost RF noise source may be used as a signal source and frequency response of the 70 cm bandpass filter determined. Once again, all data and measurements results may be saved to a computer file for additional inspection or future review.



The Spectrum Analyzer plus Tracking Generator function is particularly useful for measurement of RF amplifiers, RF directional couplers, RF filters, RF attenuators.

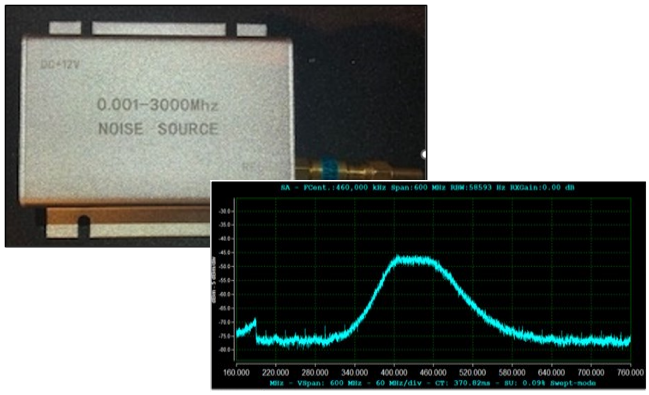


In this example, a Spectrum Analyzer plus Tracking Generator (TSA) scan from 200 MHz to 1400 MHz was conducted on the same 70 cm bandpass filter. The Satsagen software (Alberto Ferraris, IU1KVL) is a free software download that provides extraordinary and extensive functionality to control SDR radios. Importantly, the software systems I have documented continue to be supported and upgraded to add additional features and functionality. The Pluto+ SDR provides a dual role as an effective advanced RF test equipment and a base for an amateur radio VHF-UHF-SHF transceiver (50 MHz to 6 GHz).

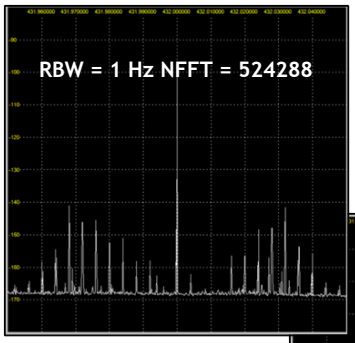
Computer control and data processing of modern electronic RF hardware provides additional functionality and reduces cost of

ownership since much of the data processing is conducted on the PC computer. For example, the Satsagen software provides unique calibration routines within the TSA application such that coax cables, RF connectors may be corrected providing high confidence measurements for the device under test (DUT).

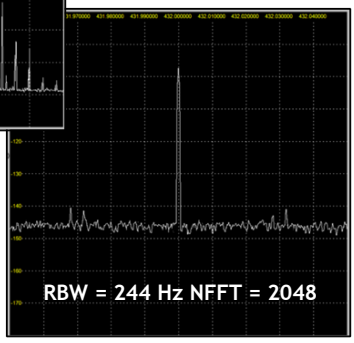
An RF noise source (purchase price ~ $30 CDN) provides a valuable addition to RF test equipment. Understanding the spectral amplitude versus frequency (flatness) of a noise source is important to ensure quantitative test results of RF devices when using this technology.



Metrology, the scientific study of measurement, teaches us that how we make the measurement greatly affects the measurement results.



This illustration demonstrates how changes in software signal processing dramatically affect the results.

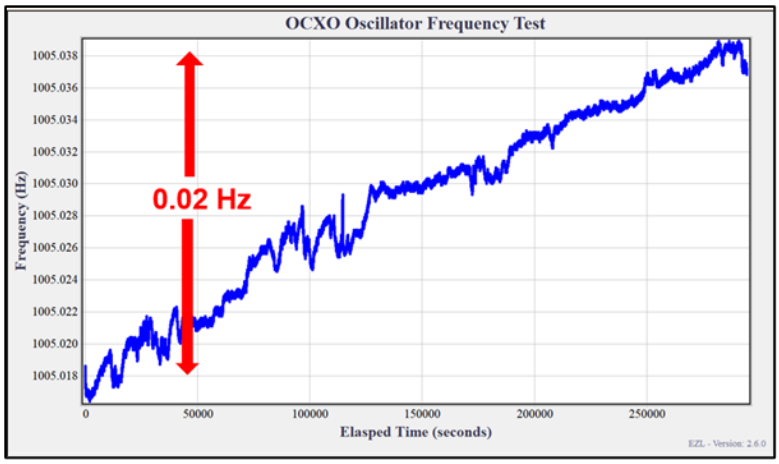


Understanding of software processing settings and expected results is an essential part of using any technology today. In short, excellent manuals are available to inform , teach and guide all of us in the use of this hardware – software combinations.

Frequency Measurement

Determination of frequency is an essential part of amateur radio communications. Amateur radio operations continue to migrate to higher frequencies as technology and equipment availability expands within the microwave frequency bands. Accuracy, stability and phase noise have become important parameters that characterize modern RF signal sources.

An example of frequency measurement is shown for a 10 MHz oven controlled crystal oscillator **(OCXO)**.



In this example 0.02 Hz (~ 0.002 ppm) frequency drift was noted over an 8 day test period.

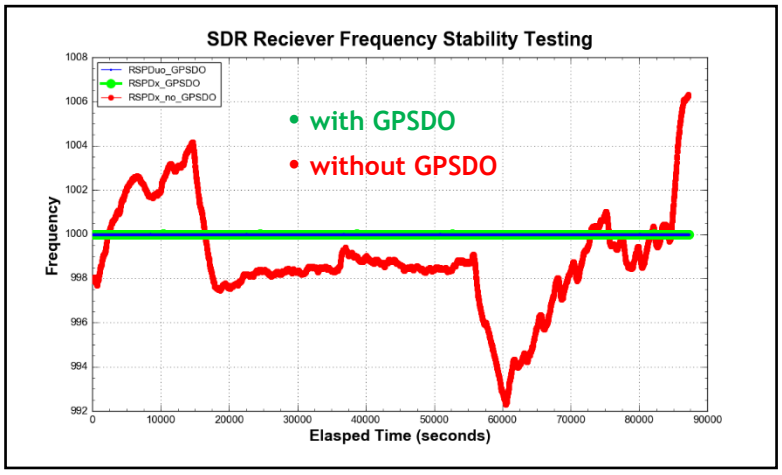
To determine this level of accuracy and resolution is indeed remarkable. To achieve these measurements, a combination of SDR radio and GPS Disciplined Oscillator **(GPSDO)** was applied.

A GPSDO works by disciplining, or steering a high quality quartz or rubidium oscillator by locking the output to a GPS signal via a tracking loop.

The disciplining mechanism works in a similar way to a phase-locked loop (PLL), but in most GPSDOs the loop filter is replaced with a microcontroller that uses software to compensate for not only the phase and frequency changes of the local oscillator, but also for the "learned" effects of aging, temperature, and other environmental parameters.

A GPSDO aims to utilize the best of both frequency sources, combining the short-term stability performance of the oscillator with the long-term stability of the GPS signals to give a reference source with excellent overall frequency stability characteristics.

An experiment was conducted using SDR receiver, in this case a **SDRplay RSPDuo**, with and without a GPS disciplined oscillator connected to provide a frequency control of this SDR device.



This data collected sequentially over a total period of two days. Inspection of this indicates the approximately 12 Hz frequency drift was reduced to essentially Zero with the GPSDO provding the frequency reference clock oscillator for the SDR.

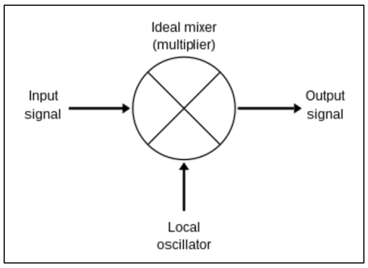
According to the manufacturer *"The Leo Bodnar GPSDO is a popular product used within the amateur radio community.*

This device outputs high purity signal with frequency locked to GPS.

Frequency stability of its output is defined by the accuracy of GPS satellite onboard Caesium references and approaches 1x10-12 or 0.000001 ppm.

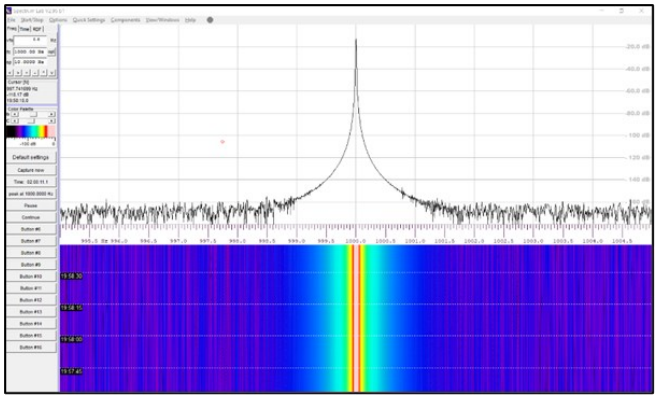
Output phase noise is shaped by high quality internal TCXO, providing clean clock signal with sub-picosecond RMS jitter."

The heterodyne measurement technique is a very useful and effective method for frequency determination. First proposed by Fessenden in 1901, it formed the basis of the superheterodyne receiver introduced by Armstrong in 1919. Fessenden was a remarkable fellow, having received hundreds of patents in various fields, most notably ones related to radio and sonar.



A **heterodyne** is a signal frequency that is created by combining or mixing two other frequencies using a signal processing technique called heterodyning, which was invented by Canadian inventor-engineer **Reginald Fessenden**.

Heterodyning is used to shift signals from one frequency range into another, and is also involved in the processes of modulation and demodulation.



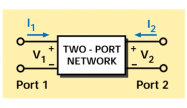
Utilizing a GPSDO controlled SDR combined with **Spectrum Lab Software** (Author: **Wolfgang "Wolf" Buescher DL4YHF**) provides remarkable frequency determination. This method, or similar technology, is frequently used for the ARRL FMT contest. With careful procedures frequency accuracy may approach $1X10^{-12}$ (0.000001 ppm).

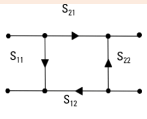
Vector Network Analysis

The first VNA was invented around 1950 and was defined as an instrument that measures the network parameters of electrical networks. The first network analyzer capable of swept amplitude and phase measurements was the Hewlett-Packard 8407 RF network analyzer, which was based on the HP 8405 vector voltmeter. The 8407 allowed comparison of the amplitude and phase of two waveforms up to 110 MHz.

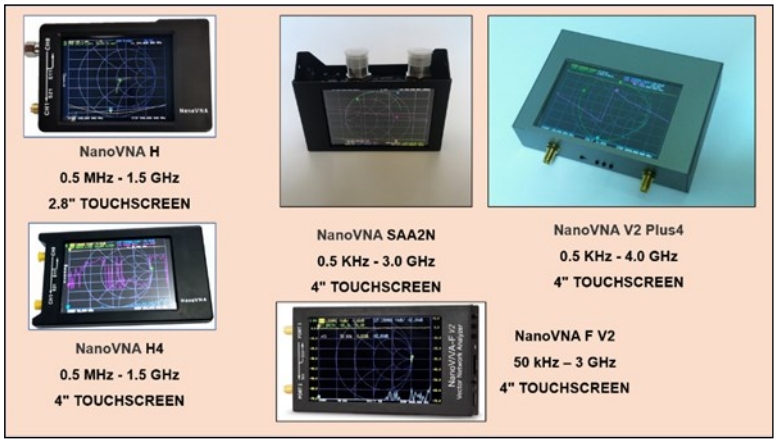
Vector Network Analyzer

A Vector Network Analyzer **(VNA)** is a device used to measure the electrical properties of RF and microwave devices and networks. It does this by sending a signal down a transmission line and measuring the reflected and transmitted signals. The VNA then uses these measurements to calculate the S-parameters if the device or network.

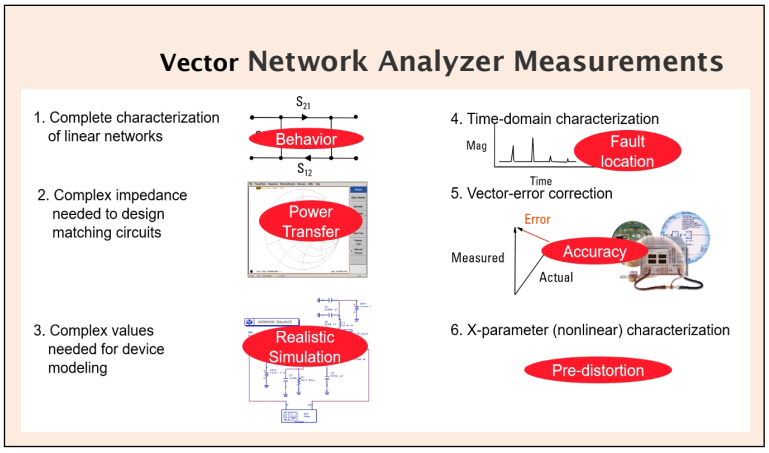




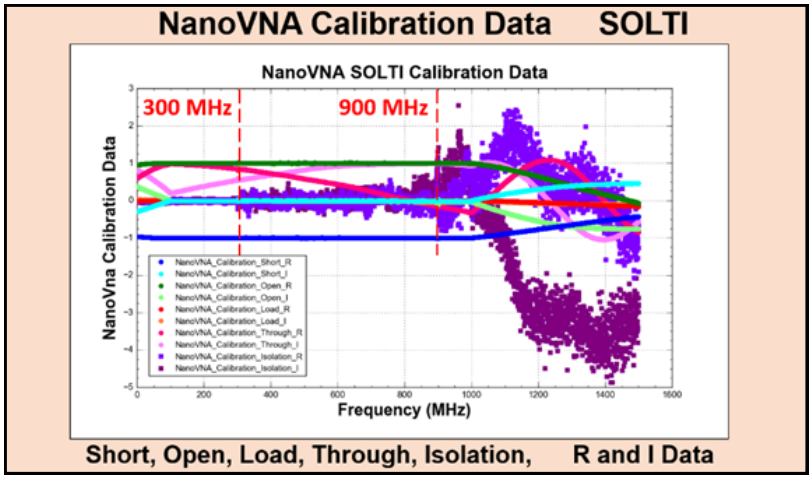
A step change when the NanoVNA was introduced in 2019 and has gained a wide acceptance in the amateur radio community. I acknowledge that a wealth of information and technical publications currently exist for this device further supporting the utility of this instrument within our community. The nanoVNA technology(~ $50 to $300 CDN) is extremely low cost versus available commercial VNA equipment.



Occasionally a vector network analyzer is described as an antenna analyzer. While it is correct that a VNA can perform critical measurements on an RF antenna system, it is also important to recognize that this technology may be applied to a broad range of RF measurements including RF filters, Transmission lines, Amplifiers, Duplexers, Couplers and more. mixers, and much more.

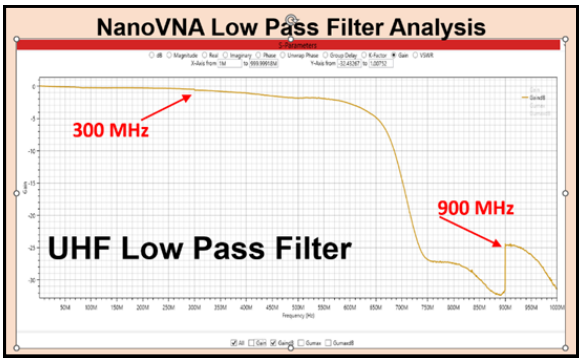


Calibration of the VNA is accomplished using short, open, load, through and isolation measurements.



This calibration data example shows calibration values for the nanoVNA obtained through this procedure.

You may notice a change of characteristic values at 300 MHz and increased data value variation at 900 MHz and beyond.

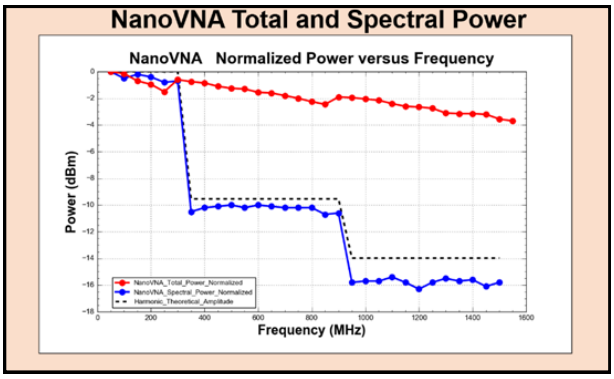


Attenuation versus frequency data is shown

A UHF low pass filter was tested using the 2-port setup for the NanoVNA.

You may observe a small discontinuity at 300 MHz and a much larger discontinuity at 900 MHz.

It is important to acknowledge the NanoVNA signal source has a maximum fundamental frequency of 300 MHz and utilizes odd order harmonics of the square wave signal for these higher frequency measurements.

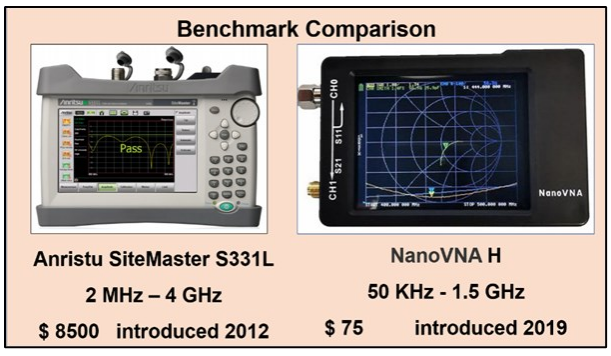


Total and frequency spectral analysis methods were applied to measure RF power levels at specific frequency values. This data shows some 16-decibel reduction in power for frequencies greater than 900 MHz compared to the sub 300 MHz values. This reduction in signal level at elevated frequencies places some limitations on measurement accuracy principally due to reduction of signal to noise values.

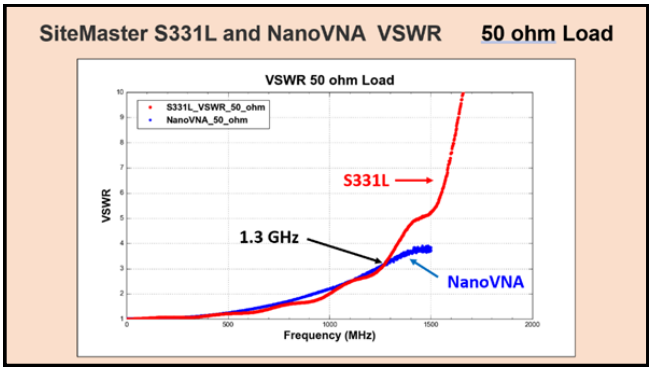
It is important to recognize that the total power measurement reflects power in fundamental and all harmonic frequencies generated by the square wave RF source. In contrast, the spectral power data reflects RF power at the identified specific frequency and eliminates all harmonic components.

A benchmark comparison of the nanoVNA versus the Sitemaster S331L instrument was conducted.

It was noted that the "*As New*" purchase price difference is a factor of 100 between these instruments. In addition, the tested nanoVNA exhibits a maximum frequency of 1.5 GHZ versus 4 GHz for the S331l.



An extensive number of identical tests and experiments were conducted on both VNA devices.

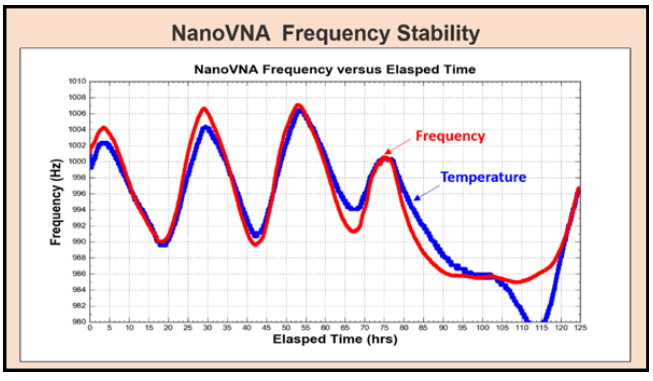


The results of this extensive testing are too numerous to document here, however in summary the nanoVNA compared favorably to the S331L for frequencies less than 900 MHZ. For frequencies above 900 MHz, the nanoVNA exhibited increased variation when referenced to the S331L data results.

Importantly, significant recent hardware advances in the nanoVNA technology are expected to reduce / eliminate these differences for the higher frequency values.

As with previously described RF technology, the nanoVNA may be controlled by a host PC computer. This has a number of advantages that enhance calibration and measurement accuracy and resolution. Once again, results may be saved on the PC computer for comparative purposes and the 4-inch display size of the device no longer becomes a limitation.

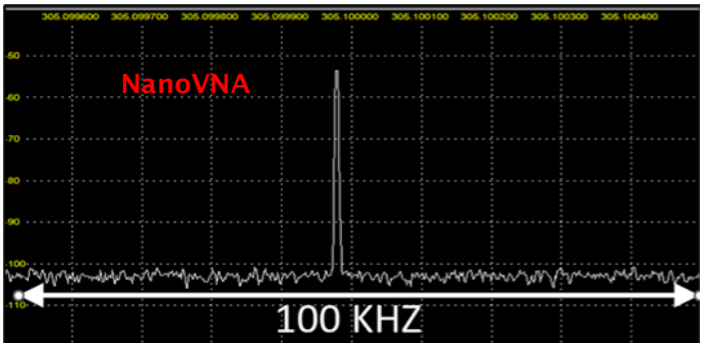
The NanoVNA was placed in CW mode with a frequency of 432.2 MHz. Frequency data was obtained using the heterodyne technique and a GPSDO controlled SDR receiver. Data obtained over a 5-day interval shows frequency variation of approximately 20 Hz, (0.05 ppm). NanoVNA absolute accuracy averaged 50 Hz (0.1 PPM).

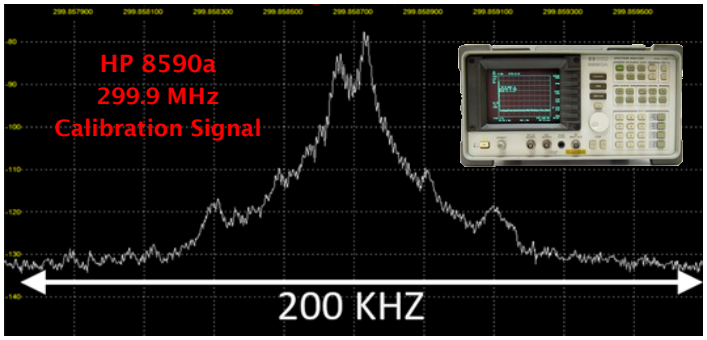


I carried out this frequency experiment in a non-temperature-controlled environment to stress the nanoVNA with large temperature swings while recording frequency. Recorded temperature versus time data clearly indicates that improved frequency stability would be expected in a normal temperature-controlled setting.

Temperature variation ranged from 67 degF to 79 degF.

This data indicates that the nanoVNA may also be used as a low-cost RF signal generator with possible power output controlled by a step attenuator system.



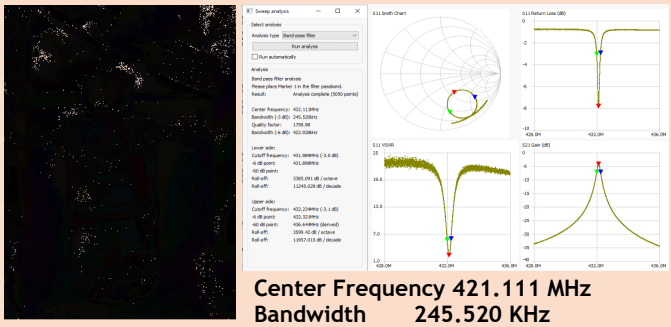


I thought it interesting to conduct a spectral comparison of a RF signal generated by the nanoVNA versus the nominal 300 MHz calibration signal generated by the legacy HP 8590a technology.

I was a bit shocked with the HP results and currently examining the validity of the calibration process for this vintage technology.

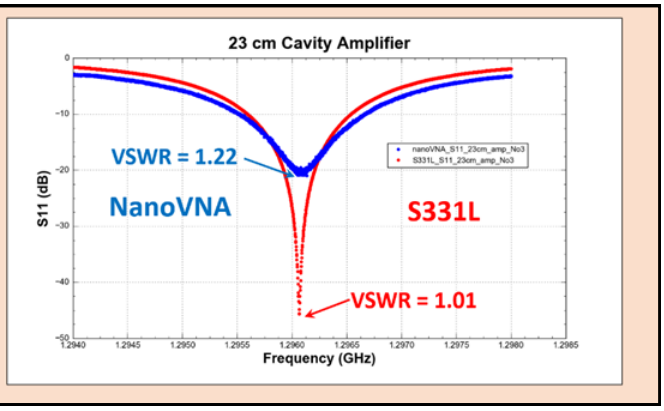
This example illustrates the NanoVNA used to characterize a UHF resonant cavity filter device.

UHF Resonant Cavity Bandpass Filter Testing



Center Frequency 421.111 MHz
Bandwidth 245.520 KHz

This is somewhat similar functionality to the spectrum analyzer – tracking generator measurements previously described; however, this method has an entry price of less than $ 50.



As previously described, when conducting measurements above 900 MHZ some differences were noted between nanoVNA and S331l results. The data shows S11 measurements conducted on a 23 cm 1296 MHz) resonant cavity. It is likely this difference would be resolved using a more current nanoVNA model versus the original model H that I used for these tests.

Conclusion

Alternatives to the purchase of RF test equipment is presented within this document. Multifunctional equipment that provides both daily use for amateur radio RF receiver and transmitter requirements combined with advanced RF test measurements that are conducted in a “as required” environment is documented. The combination of current hardware interfaced to computer software control shows significant advantage in providing an enhanced user interface and data documentation / retention benefits. Importantly, significant equipment cost reduction from 1/5 to 1/10 of that previously described by the purchase of legacy hardware is stressed. To be clear, the alternatives presented may not achieve the accuracy and resolution specifications for laboratory grade RF test instrumentation. An individual operator is encouraged to research equipment specifications versus his / her requirements to make an informed purchase decision.

~ Don VE6HQ

About the Author

Don has pursued a lifelong interest in science and engineering beginning as a youth in western Canada. He received his first amateur radio license at the age of 15 while attending high school in Edmonton, Alberta, Canada.

Don continued this interest and graduated from the University of Alberta receiving a Bachelor Science in Electrical Engineering. During the last 41 years he has worked in energy industry in Canada, the United States, Europe, South America, the Middle East and the Far East.

His technical area of interest lead to publications of nuclear magnetic resonance applied to reservoir characterization. He was granted numerous US patents for developments of pressure core technology. Don was honored to be the Distinguish Speaker at the Harvard University Energy Conference. During 2020, Don received the prestigious Hart Energy Innovators Award.

I obtained an amateur radio license in 1967 as VE6ANW, a year later achieved the advanced certification as VE6RI. I initially pursued 20-meter DX working. Soon after, I became interested in weak signal UHF propagation. After more than 50 years have passed, I have rejoined the amateur radio ranks and currently active on 20 meters and VHF / UHF bands.

Satellites

Starlink and Radio Frequency Interference: Challenges for Amateur Radio Operators

Elon Musk's SpaceX's Starlink project has rapidly become a significant presence in Earth's orbit, aiming to deliver high-speed internet to underserved regions through a constellation of low Earth orbit (LEO) satellite that orbit much closer to Earth than traditional geostationary satellites. These satellites relay signals to ground stations and users, providing high-speed internet to remote areas where traditional infrastructure is either unavailable or too expensive to implement. While the idea is groundbreaking and beneficial in many ways, there have been increasing concerns about how these satellites affect various aspects of our planet's natural environment.

One of the most widely reported consequences of the Starlink constellation is light pollution. As the number of satellites in orbit increases, so too does the likelihood of them appearing in telescope images. Starlink satellites are particularly bright when first launched, reflecting sunlight and creating visible trails across the night sky, which can obstruct and distort astronomical data. This has become a critical issue for both ground-based and space-based observatories, particularly those that monitor the faintest and most distant objects in the universe.

Astronomers have expressed concern that these bright satellites could obscure views of important celestial events, such as supernovae or the detection of potentially hazardous asteroids. The Vera C. Rubin Observatory in Chile, a massive telescope designed to observe faint objects in the night sky, has been particularly vocal about the issue, as it is expected that Starlink satellites will interfere with its mission.

SpaceX has made efforts to mitigate this impact, including designing satellites with less reflective surfaces and launching "VisorSat," a version of the satellite equipped with a sunshade to reduce brightness. These modifications have had some success, but many in the astronomy community feel that these efforts are not sufficient given the sheer number of satellites that will eventually populate the night sky.

The other impact: RF pollution

Although less publicized than Starlink's light pollution, there is also an impact through radio frequency interference (RFI). A particularly concerning issue arises with our amateur radio community, which has expressed worries over the growing RFI caused by the expanding network of satellites.

Wth the proliferation of satellites comes a major concern—radio signals and the electromagnetic spectrum, which is a finite resource. Ham radio operators, who have long used specific bands of radio frequencies for communication, exploration, and emergency services, are now finding their operations increasingly susceptible to interference from Starlink's satellite network.

For the uninitiated, amateur radio operators communicate using specific frequency bands allocated by national and international regulatory bodies, such as the International Telecommunication Union (ITU). These operators rely on clear, unobstructed channels to transmit and receive signals across vast distances, often bouncing radio waves off the ionosphere to reach other operators around the world. The success of these communications depends on avoiding interference from other sources, which can drown out signals or create noise that disrupts communication.

RFI is a well-known issue in the amateur radio world, caused by devices like power lines, televisions, and household electronics. However, satellite constellations like Starlink add a new dimension to this problem. The sheer number of satellites transmitting signals back to Earth increases the likelihood of RFI in the amateur radio spectrum, especially as the frequency range allocated for commercial satellite communication overlaps with those used by amateur radio enthusiasts.

The Technical Side of Interference

Starlink's satellites communicate in two key frequency bands: the Ku-band (12-18 GHz) and the Ka-band (26.5-40 GHz). Although these bands are outside of the primary amateur radio frequencies, they still have the potential to produce harmonic interference—unintentional signals that appear at multiples of the satellite's operating frequency, which can then overlap with the amateur bands.

Harmonics and spurious emissions can cause significant disruption to amateur radio operations, particularly in the HF (high-frequency) and VHF (very high-frequency) bands. These are the bands most commonly used by ham radio operators for long-distance communication. Starlink satellites, constantly moving across the sky and communicating with multiple ground stations, can create an environment where ham operators face constant challenges in keeping their signals clear of interference.

Efforts to Mitigate Interference

SpaceX is not unaware of the issues caused by its satellites. The company has made efforts to reduce RFI, both by collaborating with regulatory bodies like the U.S. Federal Communications Commission (FCC) and ITU and by implementing engineering solutions aimed at reducing unwanted emissions. The satellites are designed with certain filters and shielding to limit the amount of spurious radio signals they generate

Furthermore, amateur radio operators have been actively involved in lobbying for more stringent rules on satellite emissions, calling for improvements in the design and operation of satellite constellations like Starlink. For example, the American Radio Relay League (ARRL) have engaged in discussions with regulatory authorities and industry leaders to ensure that amateur bands remain protected from interference.

SpaceX's willingness to engage with regulators and stakeholders is a positive step, but there remains a lack of consensus on the long-term effectiveness of

these efforts. As the constellation grows, so too does the potential for interference, especially in more densely populated regions where multiple satellites may be visible at once.

Ongoing Challenges for Ham Radio Operators

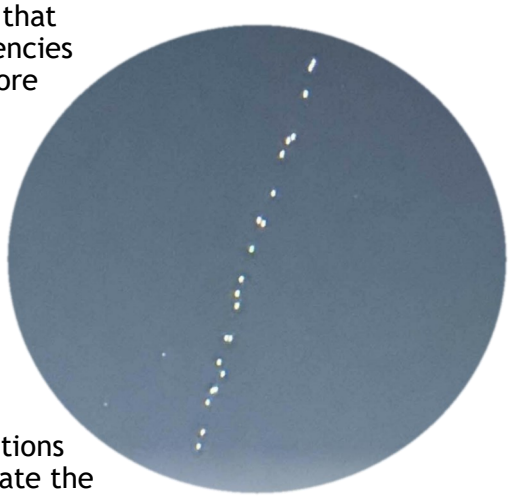
Despite the mitigations being introduced, many amateur radio operators continue to experience increased interference. Given the rapid deployment of Starlink satellites—often launching in batches of 60 or more—operators have reported challenges in maintaining clean, uninterrupted signals for their transmissions. This has been particularly noticeable in rural or remote regions, where the clear airwaves previously enjoyed by ham operators are now becoming crowded with satellite signals.

One area of concern is emergency communication. Amateur radio plays a critical role in disaster relief efforts, as it can operate independently of conventional communication networks. In times of crisis, as we have witnessed again in the previous month, ham radio operators are often the first line of communication when traditional systems fail. Interference from satellites could pose a significant risk in these scenarios, potentially hindering operators' ability to relay important messages during emergencies.

Moreover, the future looks even more uncertain as other companies, including Amazon's Project Kuiper and OneWeb, are planning to deploy their own satellite constellations. The cumulative effect of thousands of LEO satellites could make it even more difficult for amateur radio operators to find interference-free channels.

Looking Forward: What Can Be Done?

Addressing the issue of Starlink's interference with amateur radio operations is not a simple task. Regulatory bodies, such as the FCC and ITU, need to continue their efforts to manage the radio spectrum carefully and ensure that amateur radio frequencies remain protected. More stringent regulations on satellite emissions, including tighter limits on spurious and harmonic emissions, will be essential in safeguarding the future of amateur radio.



Technological innovations could also help mitigate the problem. More advanced filters, both in satellites and in ground-based ham radio equipment, could help reduce interference. Operators may also need to adapt to the changing environment by making greater use of digital modes, which are more resistant to interference than traditional analog modes.

Finally, continued dialogue between satellite operators like SpaceX and the amateur radio community is crucial. Collaborative efforts to monitor and address interference issues, alongside the development of new solutions, will be key to ensuring that both satellite communications and amateur radio can coexist in an increasingly crowded electromagnetic spectrum.

For the amateur radio community, the battle against interference is not new, but the stakes are higher now than ever before. As more satellites fill the sky, the importance of maintaining a clean and open radio spectrum for amateur operators—and for emergency communications—cannot be overstated. The future will require a delicate balance between advancing global connectivity and preserving the vital role of amateur radio in society.

~

TM80DDAY & PA80OMG

Two stations, one goal

by SANDER PD9HIX,

Two completely different stations, but with the same goal in mind: to commemorate 80 years of freedom in Europe!

Eighty years ago, on June 6, 1944, Allied forces stormed the beaches of Normandy, France. With an extraordinary effort, they overcame the (strong) enemy and set foot on mainland Europe. From there, the liberation of Europe began. Many battles were fought, and many lives were lost. Evidence of this battle is still visible, and for some, the (mental) wounds are still present.

This was our reason to travel to France and set up a commemorative radio station. It's not our first, but every time we plan a DX-pedition like this, we approach it as if it were our first.

Please allow me to introduce ourselves.

Who are we? We are radio amateurs: Erwin (on the right), PA3EFR, and me, Sander, PD9HIX. We are brothers, very close friends, Scouts, and veterans. Erwin recently retired from the forces, and I am still actively serving. We've been amateurs for almost 40 years now and have set up many JOTA stations. In the last 15+ years, we have also devoted our hobby, knowledge, and expertise to setting up commemorative stations. With these stations, we like to hear the stories behind the moments we commemorate. Many men and women still have stories to tell or have connections to the battles we honour, either through family ties or, in some cases, as witnesses to the events.

As May came to an end, a Land Rover packed with a lot of equipment and towing a mobile mast cruised the highways heading south through the Netherlands, Belgium, and France.

I live in the eastern part of the country, and Erwin lives in the west. We both turned on APRS, and we could see each other's cars on the map, slowly closing the distance. It was amusing to watch. We decided to stop overnight at a hotel in France. Early the next morning, we continued our journey and arrived in Bayeux around noon. We did some shopping and had a hot meal in a large store's cafeteria. There, we noticed several commemorative posters hanging from the ceiling. We dared to ask if we could have one for our little adventure, and the French cook was more than willing to help. He stood on a chair, took it down, and handed it to us, right in front of a busy restaurant. Very kind indeed!

In organizing this event, we made contact with local friends and officials. Erwin handled the Special Event Station call sign. He contacted the French authorities a year in advance to inquire whether we could operate a SES in France as Dutch operators. With just a bit of paperwork, everything was quickly sorted. We requested TM80DDAY as the special call sign, and to our delight, it was granted. (We heard from quite a few French stations that they were jealous some Dutch radio amateurs were custodians of this special call sign...)

We also connected with the owner of the D-Day Omaha Beach Museum to secure a location for our station. Fabienne, a very thorough and friendly person, showed us where to set up. The second in command of the community, essentially the mayor's right-hand person, had granted us permission to use his backyard. Through Fabienne, we met Monsieur Goslin, a true Frenchman with an interest in electronics and radios. A very down-to-earth man, he agreed to nearly everything we requested, even providing us with an extension cord so we could power our equipment.

After about three hours of setup, the station was ready.

It featured a 75 ft mast, positioned on the cliffs of Normandy, about 100 feet above sea level. Attached to it was a heavily modified FB23 from Fritzel, an X50 for local VHF, and a 120 ft long end-fed antenna. The latter was pulled taut towards a separate little Clark (PU12) mast further away on the premises. At the top, there was a light featuring three red LEDs and three NVG LEDs. (NVG stands for Night Vision Goggles; some aircrews can't see lights in masts due to the type of night vision cameras they use, so these LEDs emit light in a different spectrum.) The FB23 was mounted on a rotor, which also operated the top light.

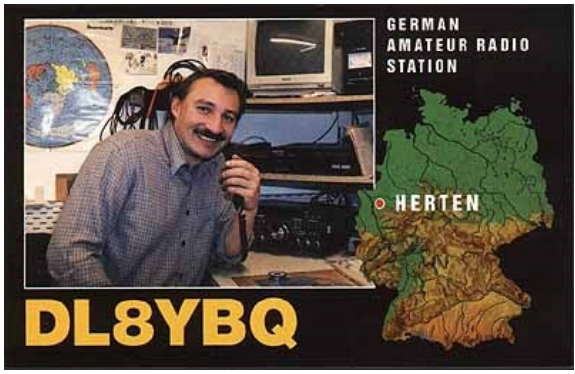
We set up a 6x6 ft party tent to house our equipment. Inside, we had a much-needed coffee machine, an electric kettle, a laptop for logging contacts and accessing the internet, a 4G router, a Yaesu FTdx1200, and an Acom 1200S with ATU. The previously mentioned poster hung on the back wall. We also used this tent for sleeping, with two stretchers and sleeping bags. In the mornings, I only had to pick up the microphone to make contacts with VK, as the conditions were excellent for talking to Australia.

We had the station up and running by June 1st. While testing the equipment and tuning the antennas on every band, I noticed a prefix I had never heard before. I had to look it up on QRZ.com, and when I saw it was Easter Island, I was stunned. The signal was crystal clear and very strong. I just had to try… and within a minute, I had made contact - 5.9 both ways. Amazing!

This location, right on the shore, with the Atlantic Ocean at the base of the antenna, combined with our power and good propagation, seemed to create a perfect setup.

We ran the station for a solid week, and there are many stories to tell. Here are just a few that stand out…

We made contact with an Italian amateur who had a mobile station, he said. Forty-metre band, 5.9! He was actually driving—going 90 on the highway near Milan. The contact was so nice that he decided to visit us. He called his wife, told her he wouldn't be home for a couple of days, filled up the tank, and headed for Normandy. He arrived the next day. We had a very nice QSO, but an even better eyeball QSO! Marco IT2CHZ had specially bought a car for his hobby. He installed a few transceivers, drilled a hole in the roof for a good antenna, and even added a small winch under the hood to bend the antenna while driving and straighten it when stationary. Very clever and neat to see. Check him out on QRZ.com—lots to see on his page!



Another nice contact we had was with a German amateur. He had brought his whole family to Normandy for the festivities and noticed our station. (Not to be missed, as we were visible from quite a distance. Even helicopters and planes took the opportunity to make an extra pass when they saw the big antenna!) He stepped into our little radio shack and was surprised to see such a station in a field. Hartmut DL8YBQ came by a couple of times and noticed the huge pile-ups we had to deal with. One night, we had to attend an online meeting, so the radio was unattended for the moment. I asked him if he'd like to take over, and although reluctant, he took the mic. He made lots of contacts over the next hour, but he was sweating like crazy and was exhausted when we finally let him off the chair. "It was such an honour to do this," he said.

Another great moment was when Sjaak (W4RIS) visited us. He was travelling through Normandy with his family, all the way from the States. We've known Sjaak for a long time now through our work on

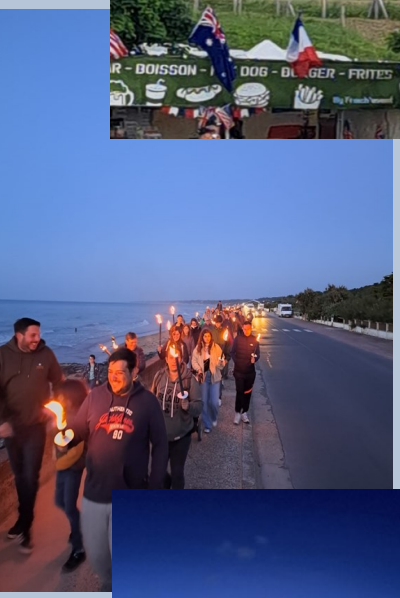
commemorative stations. He stopped by, we had dinner together, and of course, he took the mic to make a few contacts. It was really nice to see him and work with him.

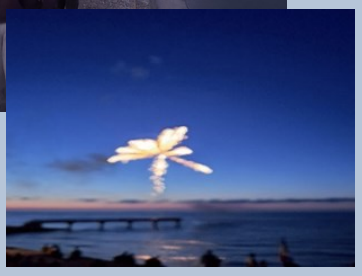
A good friend of ours, Patrick PE2PVD, was touring Normandy and spoke to us via VHF from Utah Beach. He was a good 30 miles south, with only water between his handheld FT5D and our high-placed X50, which was connected to an FT-857. It was a very nice QSO, and he visited us later that week as well.

(Was everything perfect? No… There's one remark I need to make. Our station was not a contest. Every station could take their time to chat with us. Some just wanted to get us in their logbook, while others really enjoyed a longer chat. That's exactly what we intended to do. We had amateurs on the radio who had lost friends on the Normandy beaches. Others had lost family members. Sometimes they told us where their loved ones were buried. These were sad stories tinged with pride. We even heard from amateurs who had been listening for a while to all the stories being told—it was very humbling to be a part of this. But, there are still amateurs who don't listen. They just shout and shout until they get attention or a QSO. We were so fed up with this behaviour that we even made a blacklist of stations we didn't want to work with, simply because they were rude, annoying, or not listening—disrespectful towards others. At one point, we were even jammed by an amateur from the East. (I won't say who it was or where they were from, but with WebSDR and triangulation, we were able to pinpoint their location quite accurately.) He began playing former German war music. Very disappointing. But when he released his mic, I explained to everyone listening that we had set up this station to thank the hundreds of thousands of men who fought for our freedom. It was those same troops who made it possible for us to live in freedom and pursue our hobby, and for the jammer to play his music. It went silent after that…)

We made many great contacts. Over the course of the week, we made 2,668 contacts, all in voice. We spoke with French people who had family in the resistance, and they shared their stories. We made contact with a British amateur whose father was the weatherman for D-Day. A week before D-Day, he had secretly been on the French beaches to gather weather information and sand samples. The sand samples were needed to determine if the sand was dense enough to support the vehicles they planned to land. It was incredibly humbling to hear all these stories. Especially because both Erwin and I are veterans and have seen some action ourselves. But nothing compares to what those men faced back then. I am so grateful for what they did!

Given that it was the 80th anniversary of this event, there were many festivities. There were numerous vehicles from that era, lots of people dressed like they did in the '40s, flea markets, re-enactors, and even an entire re-enactor campsite. It was all very nice to see. On June 6th, D-Day itself, the whole beach was closed off to the public. Presidents Biden and Zelenskyy, and many other VIPs were present and gave speeches on the beach. Security was very tight, and even warships were patrolling the shore.





President Biden wanted to visit Pointe-du-Hoc. Therefore, the entire area was blocked off. No one was allowed to travel—not even locals. Not even to cross a simple road to get to a store. No movement was allowed. It was very thorough, but inconvenient for the local population. Even the day after the D-Day commemorations, the main road was blocked by the French police. We noticed an Englishman who needed to catch the ferry in Dunkerque but wasn't able to get there in time.

The owner of the land where we were stationed was a high-ranking local politician. He was in charge of several important commemoration events, and since he knows what work I do, he asked me to join him in the parade on the beach and promenade. They were holding a torchlight parade. I was delighted by the invitation, and after consulting with Erwin, I went to the beach. After gathering, I was handed a torch, and once all the torches were lit, we started walking.

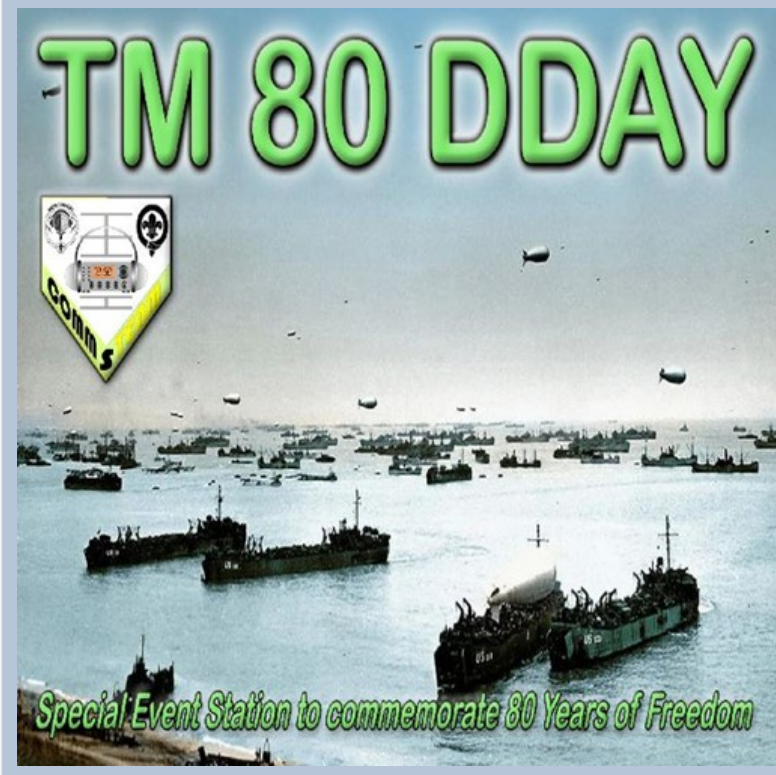
The march began at the large memorial on Omaha Beach. We walked south for about a mile until we reached the end of the promenade. Many people stood still and bowed their heads in a silent gesture of thanks and respect. I took a brief detour to the shore and stood there for a while with the burning torch, thinking of my fallen friends and comrades. It was a moment I had experienced many times before, but being on one of the D-Day beaches made it very special this time. From the north, we walked south, passing the location where the first men were buried after the invasion. I thought it was fitting to place my torch there.

By the end of the march, it had become completely dark, and to close the event, fireworks lit up the sky!

The days went by, and each one was a gift. The weather was great, the people were happy, and the atmosphere was superb. Before we knew it, the week was over. Slowly, camps were packed up, and people began heading home. The site became empty, and the vast, beautiful landscape was revealed.

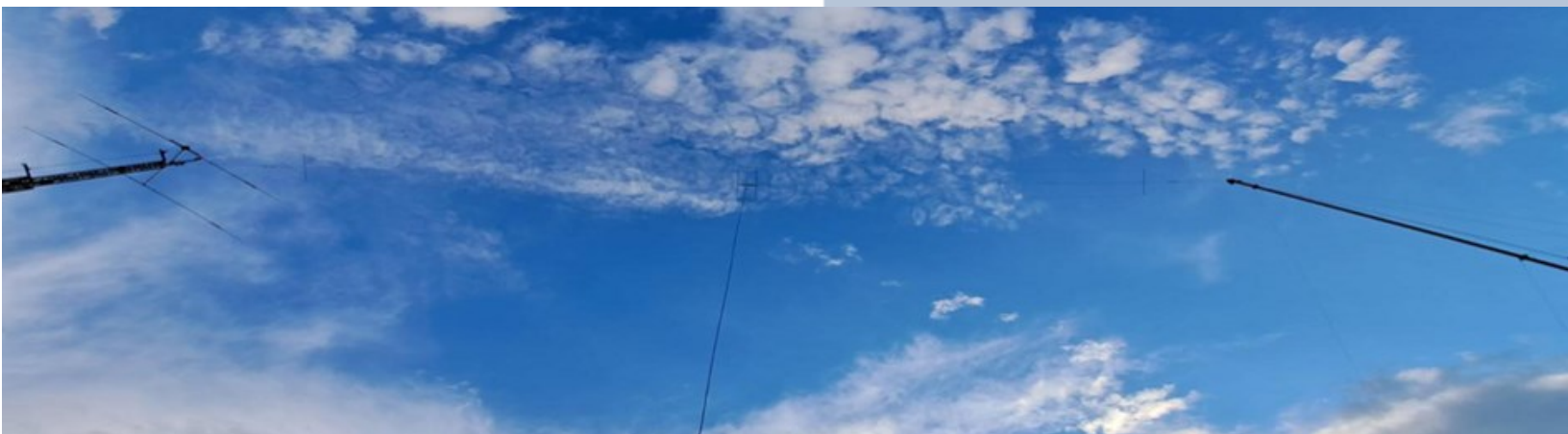
This wasn't our first time in France. About a month ago, we were at the same location with the same setup for a Scout event. Around 1,500 American Scouts held their Camporee to commemorate D-Day in advance. Since the children's parents are all in the military and often work during the D-Day events, this camp is held twice every five years: once on the anniversary and another timed between the anniversaries. The children had composed their own messages of peace, and we were asked to help the children transmit them. After approval from a committee, they came to the radio tent. Once we established a connection with another radio amateur, the children were allowed to share their messages.

During this large Scouting event, an old friend from the Netherlands visited us — Frans PE0F. He didn't know we would be there, so it was a surprise for both of us. He is a Scout and a radio amateur, and after observing us for a while, he wanted to chat. He told us he was very impressed with how we managed the station and how we handled contacts from around the world. He specifically mentioned the time we spent with people who wanted to share their stories about D-Day with us. As this year marks the 80th anniversary of the start of liberation in Europe, many battles are especially significant. Frans said he was considering setting up a special event station to commemorate Operation Market Garden and asked if we would be interested in participating. Since Erwin and I are originally from Nijmegen, and Operation Market Garden took place between Arnhem and Belgium with Nijmegen in between, we were very interested. After a quick brainstorming session, we decided to go ahead with it and begin preparing as soon as we returned from Normandy.



After two tours to Normandy, we reached the point of breaking down the station. Sjaak W4RIS showed up on the Saturday to make a few last contacts using our equipment, and together with his wife and daughter, we had supper. Dutch MREs were on the menu, and to my surprise, they all liked them. Sjaak helped us pack everything up, and after a few hours, the entire station was down, except for the party tent, which we needed for shelter on our last night. That evening, we had a nice gathering with Mr. Goslin and his wife, chatting late into the night about radios, electronics, and whatever else came up. Wine and cheese, of course—it's the French way—made for a very cozy evening.

Early the next day, we said our goodbyes and got behind the wheel. We quickly found the highway and, during the trip home, passed many old WWII vehicles on their way back as well. After about 200 miles, we split up, and after an uneventful trip, we both made it home.



Preparations for the next event began the moment we packed everything away. With a few meetings and lots of messages by email or WhatsApp, the day of the event approached quickly.

On September 12th, the same Land Rover Defender 110 cruised down the highway again, now in the opposite direction, due north. It was packed similarly, with the same trailer as in previous events. However, this time the trip was only 90 minutes instead of seven hours. Upon arriving at the campsite, I found Erwin and Frans already there. This event was to be run by a few more amateurs, forming a team of eight radio amateurs to commemorate the 80th anniversary of Operation Market Garden.

The station featured two 75-foot masts, the previously mentioned trailer with a mast, and a Clark mast T73. Between these two antenna supports, a T3FD antenna was suspended horizontally. From the mast on the trailer, we spanned two end-fed antennas—one running north-south, and the other east-west. The FB23 was mounted on the trailer mast again, along with the X50.

The radio tent was a bit larger this time, measuring 9 by 20 feet. It was solely for radio operations, while we set up a large tarp with tables and benches for coffee, food, and beverages. We were expecting a bunch of visitors this time!

The T3FD is an amazing antenna. I've seen it in various parts of the world during some of my deployments. Here, you can see it suspended between the two masts. It's an all-bander and a very quiet antenna for listening.

We were up and running on Friday the 13th. Not that we're superstitious, but we had a laugh. Once all the antennas were tuned in, we started the special event. The call sign this time: PA80OMG—commemorating 80 years of Operation Market Garden.

We used social media to announce our plans and station setup. As soon as we started calling CQ, many amateurs were waiting for us. Contact after contact was made. Propagation was still good at that time, but by the weekend, a solar storm hit, causing an almost complete blackout. Every band was down, and after some prayers, hope, and a bit of cursing, the 40-metre band opened up slightly, allowing us to work within Europe. With 800 watts going into the antenna, we managed to reach a station as far as 200 km away. But we were back in business.

The radio station was set up at a campsite next to Drop Zone November, used 80 years ago. We were only 100 yards from where General Gavin landed and began leading the battle. His efforts were needed to clear the way for the main force, which drove from Leopoldsburg, Belgium, to Arnhem. In a hammer-and-anvil movement, troops fought from the north and the south. A plaque was located just 50 yards from our station, marking one of the turning points of Hell's Highway, now called Liberation Route. A convoy of 300 WWII vehicles travelled the same route and camped next to our station. It was amazing During the week, we had many visitors—some were radio amateurs, and others were just people intrigued by what we were doing.

One morning, Paul (G4NFD), the CEO of our biggest sponsor, visited us from the UK. What a nice person and such an enthusiastic soul. He was very interested in what we were doing and how the station was set up. It was great to have him visit.

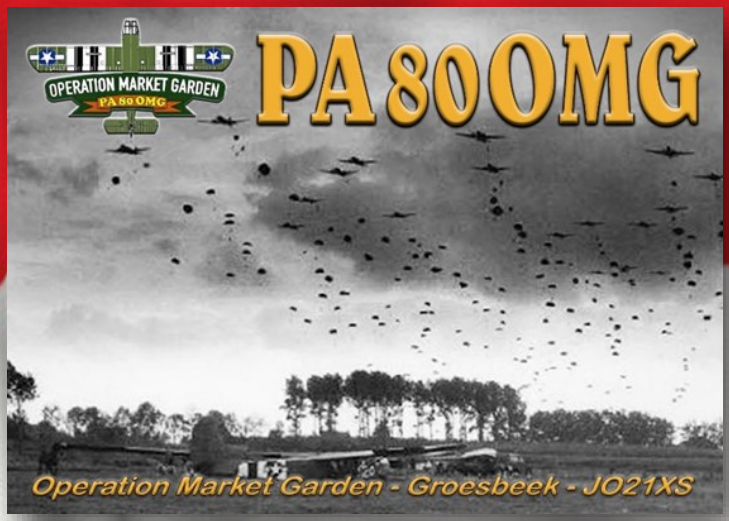
On Tuesday the 17th, the day of Operation Market Garden, a memorial was held in town. Frans and I went downtown to attend the festivities and lay a wreath. It was a nice moment with many speakers. The standout speaker was General Gavin's daughter! General Gavin led the battle at Groesbeek, and meeting his daughter and hearing her speech was humbling. There was even a veteran, 100 years old, still jolly and cheerful. I was honoured to shake hands with this legend, and Frans and I had a picture taken with him.

Many gliders (Waco's) had landed on this drop zone to deliver equipment and Jeeps. Close to the site, there is a replica on display with a small plaque to inform passersby about its significance. We visited the glider with two Scouts, who told us much about the gliders and

their use. They had planned a special event station to commemorate one glider that crashed in the southern Netherlands, killing all four crew members. The Scouts shared this story during their special event station PH80LIB.

It's great to know that many other radio amateurs do this, ensuring we never forget what happened.

The week was filled with memorable moments. Many visitors and a fair number of contacts from around the world. A highlight was when the youngest radio amateur from Germany, Leni DO7NBK, visited us. Leni is only 10 years old, and Leni's father Lars DO5VL, had heard our station during a holiday in Normandy and wanted to contact us. They drove home early just to make a contact, but unfortunately, it was the same day we had left. He didn't forget us, though, and after checking QRZ.com, he saw we were at Groesbeek.



He picked up his daughter from school and drove for hours to visit us. What a thoughtful gesture, and what a delightful young girl she is—so witty and wise. My brother Erwin helped her make contacts at the radio. I made a short video and posted it on Facebook, and the comments we received were heartwarming and all positive. She made several QSOs with our call sign, and her English was excellent. I asked her father, Lars, if he would like to make some contacts as well, but he declined, wanting to give the opportunity to his daughter.

Once again, the weather was on our side. The days were sunny, and the nights clear, though a bit moist and chilly in the mornings. Overall, it was a fantastic time. A full moon during our event added a special touch, making for stunning views that we captured in many photos.

Despite poor propagation, we managed to make over 2,000 contacts. Most were voice, some FT8 (which we ran at night to keep the equipment dry), and around 100 were in CW. This achievement was made possible by the dedication of a few radio amateurs who were constantly present, as well as some guest operators.

Keep an eye on QRZ.com for our upcoming events—we already have plenty in the works. Check out the PA3EFR website or QRZ.com for PD9HIX for updates.

~ 73, de Sander PD9HIX

A poor Ham's panadapter

Ham radio's fish-finders

by JOHN CORBY VA3KOT

John Corby VA3KOT resides in Owen Sound, Ontario but is more often found operating CW out in the "Big Blue Sky Shack". He especially enjoys activating parks for the POTA program and blogging about his experiences at HamRadioOutsidetheBox.wordpress.com

I like to think of them as ham radio fish finders – those neat little waterfall displays on many modern radios. No tuning around listening for signals like in the "good old days", just click on a signal on the waterfall display, throw out your callsign and ya got 'em hooked.

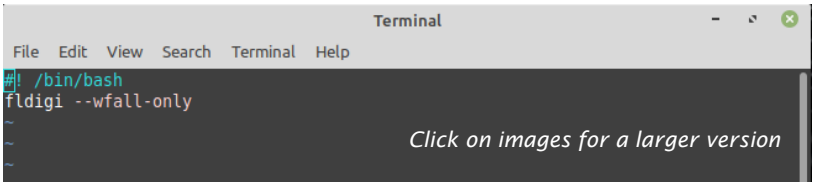
I live very close to Owen Sound Bay which is an inlet of the immense Georgian Bay which is technically part of Lake Huron. The Sydenham river flows into our local bay and at the end of summer every year, thousands of salmon swim up river, leaping over obstacles on their way to their spawning grounds up river. I used to go fishing on a chartered boat out in the bay. The boat was fitted with a fish finder and all we had to do was lower our bait right in front of the fish and haul 'em in. We would go home with several twenty pounders. It was so easy it seemed unsportsmanlike.

I have a few reservations about ham radio waterfall displays. First, none of my radios has one. Second, even if I did own a portable QRP radio with a waterfall display, my aging eyes may not be able to focus on it. Third, it would be unsportsmanlike to use one – well okay, maybe not.

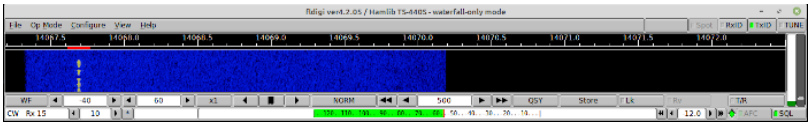
The vast majority of my operating time is spent out in the Big Blue Sky Shack – even during southern Ontario's less than comfortable winters. But there are times, like when the mercury drops to 99 below and the snow is up to the rooftop, that I do occasionally enjoy the comfort of a steaming cup of Joe

inside my warm, comfortable shack. For such occasions I thought it might be nice to go fishing for QSOs on the bands. I made an inquiry on one of the online forums and a kind VKer suggested using the “waterfall only” mode of Fldigi. Fldigi can be used for decoding CW (as well as numerous digital modes) but that would be unsportsmanlike, wouldn’t it?

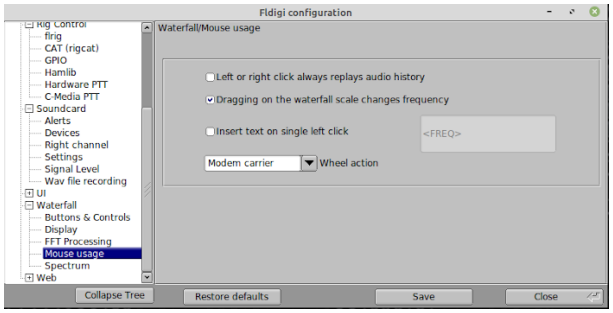
I wrote a little bash script for my Linux laptop to open Fldigi in waterfall only mode. My Linux bash skills are very limited; if you can suggest improvements please let me know in the comments.



This is the result of opening FLDIGI in waterfall only mode. Notice that the usual transmit and receive windows are absent, leaving just the waterfall.



The display looks very similar to the waterfall on a real panadapter. The major difference between this and the real McCoy is this one is based on audio frequencies, whereas a real panadapter uses IF as its signal source.

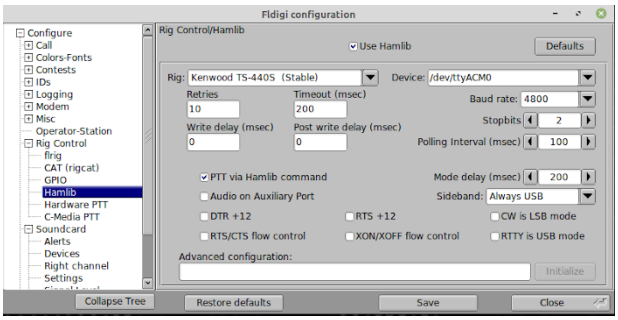


There is one more Fldigi setting you might find useful. Under |Fldigi configuration |Waterfall|Mouse usage| select “Dragging on the waterfall scale changes frequency”. Of course you can click on any signal on the waterfall then click the QSY button to change frequency, but its useful to drag the frequency scale above the waterfall to move to an adjacent part of the band.

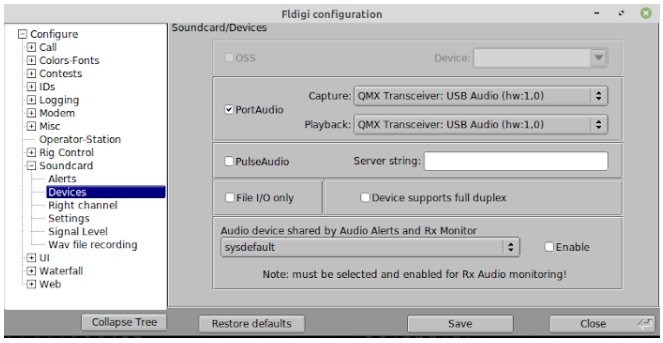
How Well Does it Work?

As an experiment, I connected my QRP Labs QMX in this manner. It should be noted that the QMX theoretically supports full panadapter operation by enabling “IQ mode” and monitoring the output with SDR software. I couldn’t get that to work very well for me. Others have also reported problems there too. The QMX is an ever-evolving product so maybe that functionality will become better defined in a future firmware release.

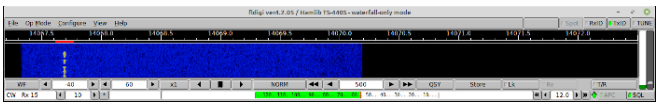
This is how I configured my QMX using |Fldigi configuration|Rig Control|. The QMX emulates a Kenwood TS-440S. Other rigs may require a different setting. Rig control is done over a USB-C to USB-C cable connection between the QMX and the laptop.



Then under |Fldigi configuration| Soundcard|Devices| select PortAudio and use the scrollbars to select the QMX Transceiver for both Capture and Playback.



Let's take another look at the resulting waterfall display:



I apologize for the resolution of this image; it's difficult to squeeze it into the width of this page, but I am sure you can see the basic idea. I did have to lower the bottom range of the waterfall sensitivity to get the waterfall to display. My base station radio has a higher audio output so at first I saw a blank display when I connected the QMX.

The rig control worked splendidly well. As I write this post we are enjoying the dog days of summer, but the dreaded snowy season is on its way before long. Maybe then I'll enjoy the comfort of that cup of Joe, or maybe even the odd wee dram, and spend winter evenings catching fish inside my nice warm shack.

~ John VA3KOT

Thank you recent visitors… 166 countries and counting—more than in my log!

33,628	248	72	20	8	3	2	1
21,857	217	72	17	7	3	2	1
13,529	208	70	15	6	3	2	1
3,738	190	70	14	6	3	2	1
2,341	189	64	13	6	3	2	1
2,005	188	48	13	6	3	2	1
931	188	48	12	5	3	2	1
903	181	46	12	5	3	2	1
739	180	45	12	5	3	2	1
733	176	43	11	5	3	2	1
705	176	39	11	4	3	1	1
587	174	34	11	4	2	1	1
544	141	33	11	4	2	1	1
452	115	31	11	4	2	1	1
439	114	30	10	4	2	1	1
375	106	30	10	4	2	1	1
370	100	28	10	4	2	1	1
351	93	28	10	4	2	1	1
327	88	27	9	4	2	1	1
307	82	20	9	4	2	1	
306	81	20	8	4	2	1	

A new WSPR transmitter

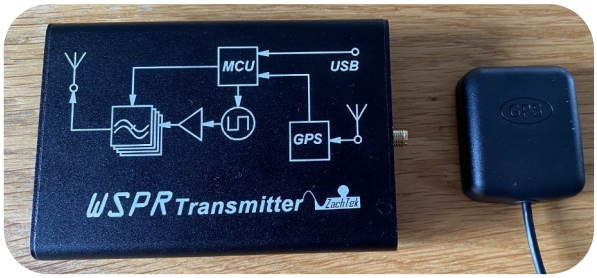
Runs independently without a PC

by MIKE WEIR VE9KK

Mike Weir VE9KK was first licensed in 1989 and upgraded to advanced in 2000. He primarily operates contests both CW and RTTY.
His blog is at: VE9KK the world of CW

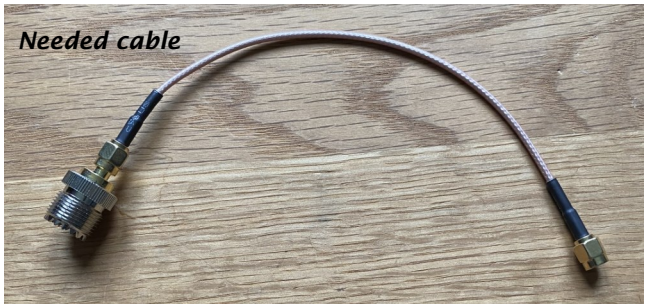
For some time I have been interested in the all-in-one type WSPR transmitter. A fellow blogger Paul PA0K posts his WSPR adventures using the SOTAbeams WSPRlite model. This unit is no longer available and when I did a web search I found very few units on the market. The unit I purchased was the Zachtek WSPR Desktop transmitter. The desktop transmitter has great reviews on eHam. The YouTube videos I watched about this product emphasized its compact size, works right out of the box, is easy to set up and can run independently without a PC.

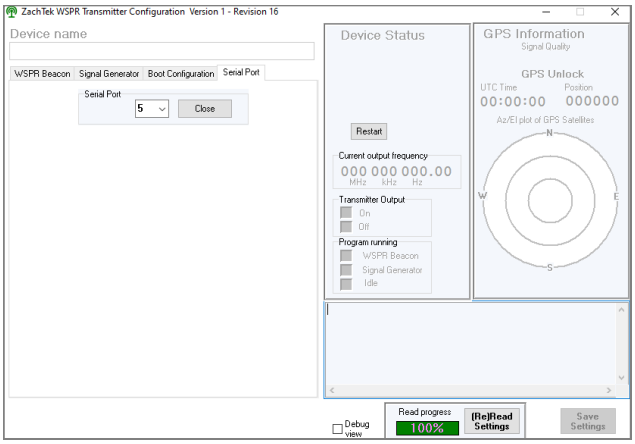
The unit I ordered was the 80m to 10m WSPR desktop. The package came from Sweden and was at my door in under 6 days. Along with the Desktop device, you also get a USB to USB-micro cable and a GPS antenna with a 3m cord with an SMA connector. If you do plan to order one of these units be aware you will need an SMA to SO239 pigtail as it does not come with the unit. They can be ordered at Zachtek's website. Fortunately, I had one as it is used with my NANO VNA unit.

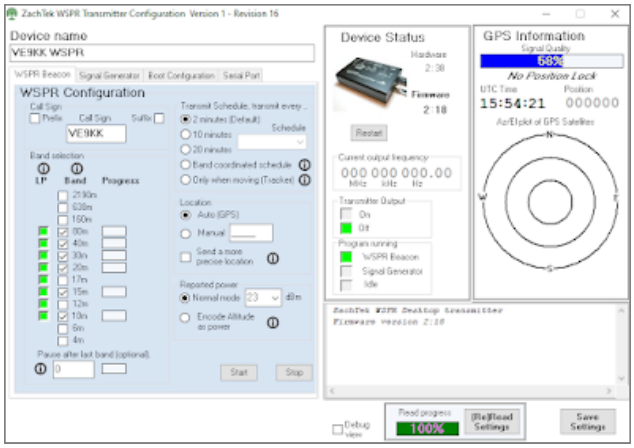


Some of the selling points for me were:

- It's small size.
- Great reviews.







- Option to run it with or without a PC.
- Easy setup software available on Zachtek site.
- An LED light on the unit that indicates good or bad GPS lock, when transmitting and when idle.
- Automatic band switching.
- The unit is not affected by an extremely high SWR.

It was time to connect up the unit and I went to Zachtek and downloaded the operating software. I connected the unit to my PC via the USB to micro cable for the first time setup of the WSPR desktop, I connected the GPS antenna and connected my Hustler 4BTV to the antenna port via the SO-239 to SMA connector. I entered my call in the box provided and selected the bands I wanted the unit to work on. As a side note, there is also a download for USB to serial driver but I already had that and it was working with no problems with my NANO VNA. I then pressed the start button on the software. I was supposed to see GPS information and the device status. Instead, I saw absolutely nothing.

Nothing happened

I tried changing the USB port I was using, I then downloaded and installed the USB to serial driver from Zachtek as maybe it was a more up-to-date driver. I tried again and nothing happened. I know my NANO VNA has no issues working on my PC and using the USB to serial port driver, maybe a Win10 update messed things up. I connected the NANO VNA via its USB cable and it came to life. I then plugged the VNA into the same port the WSPR desktop was plugged into and it worked fine.

I plugged the NANO VNA into the cable that came from Zachtek and the NANO VNA refused to start! I plugged the WSPR desktop into the NANO VNA USB cable and the unit came to life. The device status came up and the GPS showed connection status. The issue was the USB-Micro cable from Zachtek it was defective right out of the box. I informed Zachtek of this a few days ago but as of yet, I have not heard back.

The unit sprang to life

Once the cable issue was solved the unit worked like a dream. In my next post the result of a 24-hour WSPR run with my Hustler 4BTV as well why the heck did I get this thing and how is it going to help my contesting adventures?

~ Mike VE9KK

The Future of Emcomm

Here comes Starlink!

by BOB WITTE K0NR

Bob Witte K0NR maintains a great blog site, and a book at https://www.k0nr.com/wordpress/

I've been reading a number of reports from the areas affected by the two major hurricanes (Helene and Milton). The North Carolina experience is particularly interesting because people have experienced the loss of communication and electrical service for several weeks. I can imagine this same thing happening in other parts of the country, including my area. As one example, read the on-the-ground disaster report from Thomas/K4SWL.

There are two important technology disruptions showing up in North Carolina: satellite-based internet (Starlink) and mobile-phone-to-satellite (SMS) text messaging. Starlink is having a significant impact during this incident, while mobile phone satellite messaging is still emerging. Steve N8GNJ has some worthy thoughts on these topics in Zero Retires 173. Although I have served in many ARES/RACES deployments over the years, I don't consider myself an expert in this area. I'd appreciate comments from Emcomm folks who have spent more time thinking about this.

Types of Emergency Communication

Most relevant emergency comms lump into 1) short-range comms (< 5 miles) between family, friends, and neighbors. 2) medium-range comms (50 miles) to obtain information and resources. 3) long-range comms (beyond 50 miles) to connect with distant family, friends, and resources.

1. **Short-Range Comms:** This is the type of communication that is well served by mobile phones, except

when the mobile networks are down. This is happening a lot in North Carolina. Lightly licensed VHF/UHF radios such as FRS and GMRS can be used to replace your mobile phone. Think: wanting to call your neighbor 3 miles away to see if they are OK or can provide something you need. (I have a few FRS/GMRS radios in my stash to share with neighbors. See TIDRadio TD-H3) VHF/UHF ham radio is, of course, even better for this, except the parties involved need to be licensed. (OK, you can operate unlicensed in a true emergency, but that has other issues. See The Talisman Radio.)

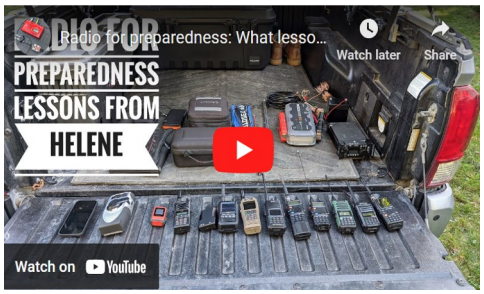
2. **Medium-Range Comms:** This is a great fit for VHF/UHF ham radio using repeaters or highly-capable base stations. GMRS repeaters can also serve this need. These communications will typically be about situational awareness and resource availability in the surrounding area. For example, someone on the local ham repeater may know whether the highway is open to the place you want to drive.
3. **Long-Range Comms:** Historically, this has been done by HF ham radio and a lot of emergency traffic is still handled this way. The shift that is happening is that setting up a Starlink earth station feeding a local WiFi network can help a lot of people in a very effective manner. Compare passing a formal piece of health-and-welfare traffic via ham radio to letting a non-licensed person simply get Wi-Fi access to their email or text messaging app. Hams are doing this, but many unlicensed techie folks have set up these systems and freely shared them with the public.

Mobile Satellite Messaging

Various providers now offer a basic text messaging capability using smartphones talking to satellites. Today, this capability is often limited to emergencies ("SOS"), and it is relatively slow. With time, this capability will certainly improve, and basic satellite texting will become ubiquitous on smartphones. This will be great for checking in with distant friends and families, but it may not be that useful for Short Range and Medium Range comms. Someday, it might include voice comms, but in the near term, it is probably just text-based.

A typical ham radio emcomm station with multiple radios covering multiple bands.

Evan K2EJT provides some useful tips based on his experience here in this video. However, he doesn't address the Starlink capability.



Summary

While much of the public appreciates the usefulness of ham radio during emergencies, I am already hearing questions like "Doesn't Starlink cover this need?" My view is that Starlink (and similar commercial sats) is very useful and will play an important emcomm role, but it does not cover all of the communication needs during incidents such as hurricanes, blizzards, wildfires, earthquakes, etc. Similarly, Mobile Satellite communications will be a great help during emergencies in the future but will probably not cover every need. Emcomm folks (ARES and RACES) will need to adapt their approach to take this into account.

Those are my thoughts. What do you think?

~ 73 Bob KØNR

KB6NU'S HAM RADIO

RSGB Operating Manual

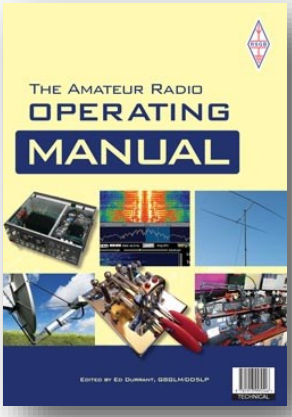
It will help you have more fun with amateur radio

by DAN ROMANCHIK KB6NU

Dan Romanchik KB6NU blogs about amateur radio at KB6NU.com when he's not trying to figure out which way current flows. Dan teaches ham radio classes, and operates CW on the HF bands. Look for him on 30m, 40m, and 80m. You can email him at cwgeek@kb6nu.com

A couple of months ago, Ed Durrant, DD5LP, my co-presenter on the ICQ Podcast, emailed me and told me that he was going to be the editor of the next edition of the RSGB's operating manual. Knowing that I was a Parks on the Air (POTA) enthusiast, he asked if I would write the section on POTA. I quickly agreed. My payment was a copy of the book, which arrived a couple weeks ago.

The topics covered by this book are very similar to topics you'll find in The ARRL Operating Manual for Radio Amateurs, and except for the chapter on regulations, all of the information in this book is applicable to radio amateurs no matter where they live and operate. There are chapters on:



- what frequencies amateurs can use
- what modes amateurs can use
- how to make contacts
- how signals propagate
- how to work DX
- contesting and awards

- mobile and portable operation (where you'll find what I wrote about POTA, as well as sections on SOTA, BOTA, IOTA, and more)
- FM, repeater, VHF, UHF, and satellite operations
- logging and QSLing

Plus, there is an appendix which list all of the DXCC entities and their call sign prefixes, as well as an appendix on how to make foreign language contacts, if you're feeling adventurous.

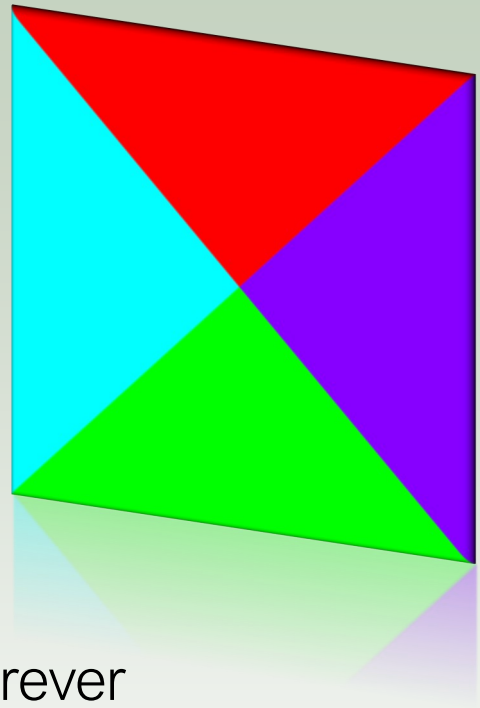
My section aside, this would be a great book for a newcomer to amateur radio. It's a great introduction to all of the operating fun we can have in our hobby. It might also be a good book for some of us old timers who may have gotten stuck in our ways. There's always something new to try in amateur radio, and this book could help you get started in doing something new and fun.

~ Dan KB6NU

This photo of yours truly operating POTA from US-1573 appears in this edition of The Amateur Radio Operating Manual. I suggested to Ed that he might want to use a picture of a British ham operating from a British park, but he insisted on getting my picture into the book.

Ed Durrant, G8GLM/DD5LP/VK2JI. The Amateur Radio Operating Manual (Nineth Edition). 2024. Radio Society of Great Britain (RSGB). £17.99.

Foundations of Amateur Radio



Surprising ideas that change you forever

by ONNO BENSCHOP VK6FLAB

Onno Benschop
VK6FLAB
To listen to the podcast, visit the website: http://podcasts.vk6flab.com/. You can also use your podcast tool of choice and search for my callsign, VK6FLAB.

Full instructions on how to listen are here: https://podcasts.vk6flab.com/about/help

Every now and then you come across an idea that throws you for a loop. It comes seemingly out of nowhere and once you've seen it, you cannot unsee it. It's a lot like a 1929 painting I like called "The Treachery of Images", also known as "Ceci n'est pas une pipe", or in English, "This is Not a Pipe" by Belgian surrealist painter René Magritte. If you're not familiar with it, it's a painting of a pipe, and by being a painting, it's not a pipe. Obviously.

Before I go into the idea that rocked my world, I need to set the stage a little.

There are several modes I've discussed before, WSPR, or Weak Signal Propagation Reporter, FT8 or Franke-Taylor design, 8-FSK modulation and plenty others.

Each of these modes has one thing in common. They require that all participants are using the same time. That is, both sender and receiver need to agree on when "now" is for this to work.

A WSPR signal takes 110.6 seconds, every 120 seconds, starting on the even minute. It requires that the transmitter and receiver agree on the time within about 2 seconds.

An FT8 signal takes 12.6 seconds within a 15 second window. It requires an accuracy of about 20 milliseconds.

These timekeeping requirements are pretty easy to achieve in a modern network connected computer. You turn on a thing called NTP, or Network Time Protocol, point it at an appropriate clock and off you go.

If you're not connected to the Internet, then things get squirrelly pretty quickly. You could buy yourself a GPS, set up a link between the GPS and your computer, run some software and use the GPS clock to synchronise time on your computer.

Of course, this requires a GPS, a serial cable, software, configuration, battery power to keep the GPS running and probably a couple of other things. I've never done this, but given what I'm about to share, I don't think I ever will.

What if you used a WSPR, or an FT8 signal, from someone else to synchronise your clock? If you've ever launched WSJT-X, you'll have seen a column marked DT, that's Delta Time, or the difference in time between the clock on your computer and that of the transmitter.

If you could read the difference and use it to adjust your clock, you'd be in business.

Charles NK8O pointed me to a GitHub Gist with a single little Python script, written by Peter K6PLI. It updates the clock on your computer using the Delta Time from WSJT-X.

I'd point you at the script from here, but 3a730575, and 24 more characters, and that's just one element of the URL, doesn't run quite off the tongue, so I've cloned it into my VK6FLAB GitHub repository where it's called wsjt-time-sync.

I added Peter's description to the ReadMe file, but I can take no credit for the effort, or the idea, that's all Peter.

So, synchronise your clock using the signal that you're trying to decode. Seems pretty obvious now, but that was a brand new notion for me.

Of course now I'm excited and wondering where else I might use this.

Let me know if there's more to this that tickles your fancy.

Also, just because I know Charles will poke my eye out with a Morse key if I don't mention this, you could use this script on your next POTA, Parks On The Air, or WWFF, World Wide Flora and Fauna activation, or anywhere else you go portable to make some noise.

I know, right, Charles, using FT8 instead of Morse Code, what's next, the end of the hobby? I'll tell you a secret. From time to time, he even uses his voice!

~ I'm Onno VK6FLAB

What does an actual minimal set-up look like?

The other day I was packing the car to go on a little trip an hour out of the city to see the Milky Way. I briefly entertained the idea of bringing my radio gear with me to get on air to make some noise.

I resisted the urge, mainly because thinking about this didn't fill me with joy, rather it made me groan.

Now to be absolutely clear, I adore going out into the scrub with my radio gear. I love getting on air and making noise. I like doing this with friends.

If the time spent is about amateur radio, in other words, if I'm doing this with other amateurs, preparation and set up are part of the experience.

All podcast transcripts are collated and edited in an annual volume which you can find by searching for my callsign on your local Amazon store, or visit my author page: http://amazon.com/author/owh. Volume 7 is out now.

Feel free to get in touch directly via email: cq@vk6flab.com, follow on twitter: @vk6flab or check the website for more: http://vk6flab.com/

If you'd like to join a weekly net for new and returning amateurs, check out the details at http://ftroop.vk6flab.com/, the net runs every week on Saturday, from 00:00 to 01:00 UTC on Echolink, IRLP, AllStar Link, IRN and 2m/70cm FM via various repeaters.

If you'd like to participate in discussion about the podcast or about amateur radio, you can visit the Facebook group: https://www.facebook.com/groups/foundations.itmaze

This podcast episode was produced by Onno (VK6FLAB). You can find more at http://vk6flab.com/

However, if I'm on my own, or with my non-amateur SO, significant other, then preparation and set up often take more time than the actual on-air activity and by the time that things are humming along, we're ready to do something else, fine food, nice view, coffee, you name it, anything other than radio.

So, how can I make the preparation and set up to be something much less time consuming? I don't really want to take over our car and bolt the radio back into it, nor do I want to strap a multi-tap antenna to the roof. At the other end, I also have no desire to bring a wire, look for a tree, do some throwing, find a place to sit and do the rest of the preparation to get on air.

In other words, I want my cake and eat it too.

What might that look like?

One of my fellow amateurs has a telescopic whip, looks like a transistor radio antenna on steroids, but using that requires that you bring something to tune it, given that the ground is going to influence the antenna in unexpected ways.

I could go out and buy a QRP radio with an in-built tuner, make the whip as long as it goes, perhaps even make it into a vertical dipole by combining two and start playing, but I'm not there yet.

Of course I'm not the first to try any of this. The Parks On The Air and Summits On The Air activators are all over this type of activity, hopefully they've written some of their learnings down. I confess that I haven't found anything yet.

How much of this have you achieved? What compromises did you make, what modes do you use when you're operating like this, mind you, I can hear my friend Charles NK8O from here, "Use Morse Onno", so I can take that as a given.

All I need to do is learn it.

~ I'm Onno VK6FLAB

Free Stuff recipient for the Great Scott Gadgets

The belated February 2024 Free Stuff recipient for the Great Scott Gadgets Free Stuff Program is Adam Drake! Adam, a teacher in Canada, sponsors 3 clubs at his high-school - a competitive robotics club, a model railway club, and a D&D club. All of these clubs are fully funded from either internal school funds, the school PAC (Parental Advisory Council) or the NSHSS. This Summer Adam ran an RF Comms summer school where 18 students gained their amateur radio certification!

Following the success of the RF Comms summer school, Adam is now starting another after-school club: "RF Communications" - this club will teach students all about wireless communications such as Bluetooth, Wi-Fi, cellular and radio (HF, VHF, UHF etc). Students will learn the theory of RF (radio frequency) communications, but the focus will be on practical uses of the technology. Students who do not yet have their radio licenses will have more chances to study and gain their Canadian Amateur Radio licences through this club.

We will be sending Adam a HackRF One to support these clubs and the students they impact. Thank you Adam for all you do in your community!"

~ Straithe

Great Scott Gadgets

No-Ham Recipes

Almond chicken casserole

by SUSAN BARABAS VE3BEC

Try different types and shapes of noodles for variety. For those with allergies to wheat, try ri or buckwheat noodles. Buckwheat is not related to wheat. Buckwheat noodles are found in Japanese food stores and in whole foods stores, labelled as "soba" noodles. But be sure th there is no wheat mixed with the buckwheat; sometimes the two grains are mixed.

- 3 tablespoons (45 ml) fat, drippings or oil
- ½ cup (125 ml) bread crumbs, buttered
- ¼ teaspoon (1.25 ml) dry mustard
- ½ cup (125 ml) chicken stock or chicken soup flavouring (2 cubes) plus ½ cup (125 ml) water
- 1½ cups (375 ml) cooked chicken or turkey, diced
- ½ cup (125 ml) almonds, toasted
- 2½ cups (625 ml) noodles, cooked
- 2/3 cup (180 ml) celery
- 1 cup (250 ml) canned tomatoes
- ½ teaspoon (2.5 ml) salt
- 1/3 cup (90 ml) chopped onion
- ¼ cup (65 ml) chopped green pepper
- 1 tablespoon (15 ml) all-purpose flour

Preheat oven to 350 F (180C or a very moderate oven)

Melt fat in frying pan. Add celery, onion and green pepper. Sauté vegetables until lightly co Stir in flour. Add tomatoes, stock, salt and mustard. Cook until mixture thickens. Remove fr heat. Add diced meat, almonds and noodles. Pour into greased 2 quart (2 litre) casserole c and sprinkle with buttered bread crumbs. Bake for 30 to 40 minutes. Makes 6 servings.

Back to Basics

From The Canadian Basic Question Bank

The R-S-T System

Understanding Readability, Strength and Tone

John Schouten VE7TI has been teaching amateur radio courses for over 20 years, and is the Course Coordinator for Surrey Amateur Radio Communications

The R-S-T system of signal reporting is a critical tool used by amateur radio operators to communicate the quality of radio signals during transmissions. This widely adopted system helps operators assess and understand the readability, strength, and tone of a signal, ensuring efficient communication across different modes and frequencies. Developed in the early 20th century, the R-S-T system remains fundamental to radio communication today, providing a standardized method for signal reporting across the global amateur radio community.

There are several, questions in the Canadian Amateur Radio Basic Question Bank that reference the R-S-T system and examples of its use. Here are two of these questions:

B-2-6-1 What are "RST" signal reports?

A. A short way to describe signal reception

B. A short way to describe transmitter power

C. A short way to describe sunspot activity

D. A short way to describe ionospheric conditions

B-2-6-3 What is the meaning of: "Your signal report is 5 7"?

A. Your signal is readable with considerable difficulty

B. Your signal is perfectly readable with near pure tone

C. Your signal is perfectly readable, but weak

D. Your signal is perfectly readable and moderately strong

This issue we explore the history, development, and structure of the R-S-T system, its importance in various communication modes, and best practices for its use in amateur radio operations.

Historical Context of the R-S-T System

The R-S-T system originated in the early 1900s, evolving alongside the growth of radio technology. As radio became an increasingly popular medium for communication—especially among early amateur radio enthusiasts—the need for a consistent and objective way to report signal quality emerged. Early radio signals were often plagued by interference, poor modulation, and distortion, which made it difficult to ensure clear communication. The R-S-T system provided a solution, offering a standardized framework that allowed radio operators to quickly convey the quality of a signal in three critical areas: readability (R), signal strength (S), and tone (T).

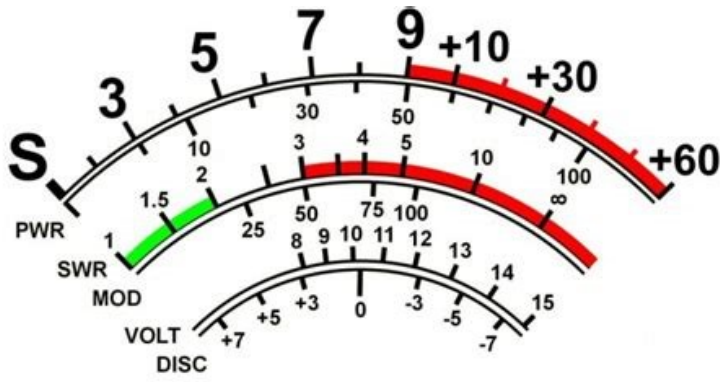
Initially developed for Morse code (CW) transmissions, the R-S-T system has since been adapted for use in other modes such as single sideband (SSB), amplitude modulation (AM), and frequency modulation (FM). While Morse code remains the primary mode where tone is a factor, the R-S-T system's readability and strength components are universally applicable.

The Components of the R-S-T System

The R-S-T system is based on a three-digit code that evaluates three distinct aspects of a radio signal:

Readability (R): Measures how clearly the transmitted signal can be understood. It is graded on a scale from 1 to 5.

Strength (S): Assesses the signal's power and its ability to be received clearly at the operator's station. The strength is rated from 1 to 9. The ‘S’ (signal strength) scale om most transceivers will provide an indication of signal strength.



The top ‘S’ scale is used for signal strength

Tone (T): Applicable primarily to Morse code and continuous wave (CW) transmissions, this rating evaluates the purity and quality of the signal’s tone. Tone is rated on a scale from 1 to 9.

In practice, the R-S-T report is conveyed as a three-digit number such as 5 9 9 or 5 7 9, with the first digit corresponding to readability, the second to strength, and the third to tone. For voice communications (SSB or FM), tone is typically omitted, resulting in a two-digit report (e.g., 5 9 or 5 8).

Readability (R): Measuring Signal Clarity Readability is the most critical component in determining how understandable a radio signal is. The scale for readability ranges from 1 (unreadable) to 5 (perfectly readable), and is often considered the most subjective part of the R-S-T system since it depends on the operator's ability to interpret the signal.

The readability scale defined

Unreadable: The signal is so distorted or interfered with that it cannot be understood at all.

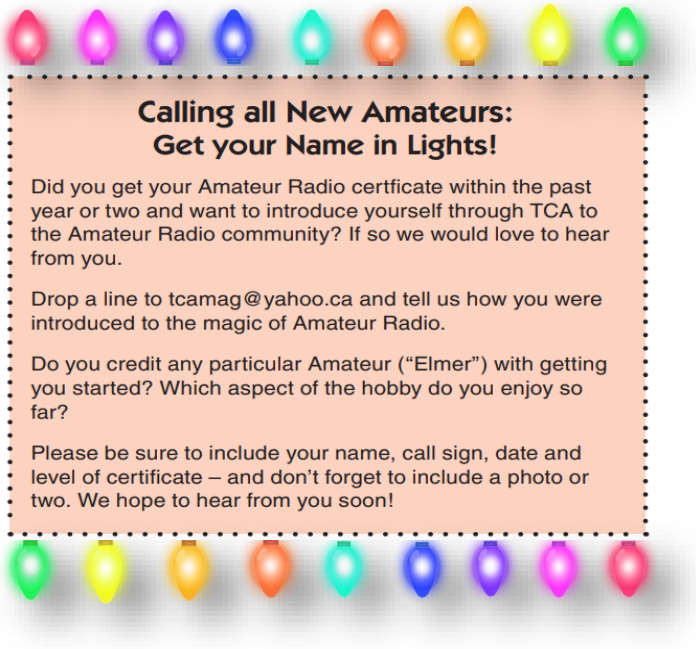
Barely readable: Occasional words or fragments of the transmission may be discerned, but the signal is mostly unintelligible.

Readable with difficulty: The signal can be understood with some effort, though there may be interference or noise present.

Readable with little difficulty: The signal is mostly clear, with only minor issues such as faint noise or distortion.

Perfectly readable: The signal is entirely clear, with no interference or distortion. In practical terms, a report of "R5" indicates that the receiving operator has no trouble understanding the transmission, while "R3" or below suggests significant difficulties in communication. Readability issues may stem from various factors, including atmospheric interference, equipment limitations, or operator errors.

Signal Strength (S): Assessing Signal Power
The second component of the R-S-T system evaluates the strength of the received signal. The scale for signal strength ranges from 1 (faint signals) to 9 (extremely strong signals), with an emphasis on the operator's subjective assessment based on the signal's audibility and consistency. Many modern radio receivers are equipped with signal strength meters (S-meters), which offer a more objective measurement of signal strength.



The signal strength scale defined

Faint signals: Barely perceptible signals, often difficult to discern from background noise.

Very weak signals: Signals are weak but detectable, though communication may be challenging.

Weak signals: The signal is audible but not strong, and may be prone to fading.

Fair signals: The signal is clear enough to understand but lacks strong power.
Fairly good signals: The signal is relatively strong and mostly stable, though some fluctuation may occur.

Good signals: The signal is solid, with good power and minimal interference.
Moderately strong signals: The signal is very strong, with clear and stable communication.

Strong signals: The signal is extremely clear, with no difficulty in receiving.

Extremely strong signals: The signal is overwhelmingly powerful and easily heard above any noise.

Signal strength is influenced by a variety of factors, including transmission power, antenna efficiency, propagation conditions, and geographical distance. In contests or when working distant stations (DX), strong signals are especially prized, though even weak signals can often be successfully communicated if readability is high.

Tone (T): Quality of CW Transmission
The tone component of the R-S-T system is unique to Morse code and continuous wave (CW) transmissions. It evaluates the purity and steadiness of the signal's tone, which can be affected by the quality of the transmitting equipment, especially the transmitter's frequency stability. Tone is rated on a scale from 1 to 9, with higher numbers indicating a cleaner, more stable signal.

Value	1936 definition	modern definition
1	Extremely rough hissing note	Sixty cycle a.c or less, very rough and broad
2	Very rough a.c. note, no trace of musicality	Very rough a.c., very harsh and broad
3	Rough, low-pitched a.c. note, slightly musical	Rough a.c. tone, rectified but not filtered
4	Rather rough a.c. note, moderately musical	Rough note, some trace of filtering
5	Musically modulated note	Filtered rectified a.c. but strongly ripple-modulated
6	Modulated note, slight trace of whistle	Filtered tone, definite trace of ripple modulation
7	Near d.c. note, smooth ripple	Near pure tone, trace of ripple modulation
8	Good d.c. note, just a trace of ripple	Near perfect tone, slight trace of modulation
9	Purest d.c. note	Perfect tone, no trace of ripple or modulation of any kind
If there are other notable tonal qualities add one or more of the letters **A**–**X**, *listed below, after the number.*		

The tone scale is defined in the chart above.

Suffixes were historically added to indicate other signal properties, and might be sent as 599K to indicate a clear, strong signal but with bothersome key clicks.

Suffix code	Meaning
A	signal distorted by auroral propagation
C	"chirp" (frequency shift when keying)
D	"drift" (frequency wandering)
M	signal distorted by multipath propagation
S	signal distorted by scatter propagation
X	stable frequency (crystal control)

But why do we fib about true R-S-T in a contest?

Have you ever worked an amateur radio contest? If you have you will have noticed and likely been puzzled by consistent 5 9 signal reports even though you have been asked to repeat your exchange five times. In amateur radio contests, it's common to see participants giving inflated R-S-T reports, such as the near-ubiquitous "5 9 9" or "5 9." This happens for several reasons:

Speed and Efficiency: Contests are time-sensitive events where operators aim to make as many contacts as possible in a short period. A quick "599" report simplifies the exchange process. Giving a more nuanced or accurate R-S-T report would take additional time, slowing down the rate at which contacts (QSOs) are logged.

Tradition: Over the years, contest operators have developed a habit of giving "599" reports regardless of the actual signal quality. This expectation has become ingrained, and operators often expect to both give and receive "5 9 9" reports without putting much thought into it.

Minimal Relevance of Tone: Especially in Morse code (CW) contests, the tone (T) part of the R-S-T report is often of little concern since modern equipment generates clean signals. As a result, operators may default to "5 9 9" because there is little variation in tone quality.

Propagational Impact: Propagation conditions may cause signal strength and readability to fluctuate throughout a QSO. Instead of adjusting the R-S-T report to reflect these changes, operators often stick with the standard "5 9 9" to keep things simple.

Mutual Convenience: Both contest participants understand that the focus is not on exact signal reports but on the number of contacts. By using "599," they mutually agree to streamline the process.

Focus on Other Metrics: In contests, the goal is to maximize the number of contacts or points, not necessarily to provide detailed signal reports. The report becomes more of a formality than a genuine assessment of signal quality.

Best Practices for Using the R-S-T System

Accurate and consistent use of the R-S-T system ensures that radio operators can effectively report signal quality, enhancing communication efficiency. The following best practices can help amateur radio operators in Canada and elsewhere use the R-S-T system effectively:

Be Objective: While signal reporting is inherently subjective, it's important to aim for consistency when giving R-S-T reports. Avoid inflating signal reports, particularly during contests or when working DX, as accurate feedback benefits both operators.

Use Your Equipment: Modern receivers are equipped with tools like S-meters that can provide more objective measurements of signal strength. Use these instruments to aid your assessments, but be mindful that the S-meter may not always reflect actual signal strength due to receiver calibration or other factors.

Adapt to Mode: In voice communications (SSB, FM, etc.), only the R and S components of the report are used since tone is irrelevant. Ensure you omit the tone rating in these cases.

Consider Propagation: Signal strength can fluctuate due to changing propagation conditions, especially on HF bands. Provide an average report that reflects the overall quality of the signal rather than momentary peaks or dips.

Provide Feedback: If you notice a significant readability or tone issue, inform the transmitting operator. This feedback can help them troubleshoot equipment problems or adjust their transmission for clearer communication.

Adjust Reports for QSB: In cases of QSB (fading), where the signal strength varies over time, you might give a report such as "5 5 to 5 8 QSB" to indicate the signal fluctuates between two values.

Importance of the R-S-T System in Canadian Amateur Radio

In Canada, as in other countries, the R-S-T system is essential for amateur radio operations. It plays a key role in daily communications, contests, and emergency operations. For Canadian operators, clear and consistent R-S-T reporting is particularly important given the vast geographic distances and varying propagation conditions across the country.

Moreover, Canada's diverse terrain, ranging from coastal regions to mountainous areas, can have a significant impact on radio signal propagation, making the R-S-T system an indispensable tool for assessing the quality of signals over both short and long distances. Accurate reporting helps operators understand the effectiveness of their equipment and adjust their transmission settings to improve communication, especially when communicating with operators in remote areas.

Here are the answers to the two questions listed at the beginning of this article:

B-2-6-1 What are "RST" signal reports?

A. A short way to describe signal reception

Explanation: "RST", A short way to describe signal reception (Readability: 1 to 5, Signal Strength: 1 to 9, Tone Quality (for Morse): 1 to 9).

B-2-6-3 What is the meaning of: "Your signal report is 5 7"?

D. Your signal is perfectly readable and moderately strong

Explanation: For example, "5 7" perfectly readable, moderately strong.

~

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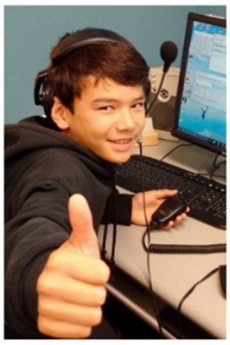

- Ideal for outdoors activities. Long range communications anywhere for free without commercial infrastructure
- Enhance your personal and your community's preparedness in an emergency
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- Participate in 'Radio Sports' like Contesting and Hidden Transmitter Hunts
- Practice an exciting hobby or start a career opportunity

City of Surrey
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Surrey Emergency Program Amateur Radio
https://separ.ca/

SARC
Surrey Amateur Radio Communications
http://ve7sar.net

NOVEMBER 2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2 Coffee: 0700 Denny's - King George & 68 Ave. OTC Open 0930
Event details: SARC—SEPAR 'Live' calendar link All contest information: WA7BNM Contest Calendar: Home						
3	4 **Basic Course 19-21:00**	5 1930 SEPAR Net **2000 SARC Net** 18:00 hrs	6	7 **2000 SARC GOTA Net**	8	9 Coffee: 0700 **Antenna Workshop OTC 09:30-Noon** Contest: WAE DX Contest (RTTY) Burnaby Amateur Radio Club Swap Meet (9am to noon)
10 Contest: WAE DX Contest (RTTY)	11 **Basic Course 19-21:00** Remembrance Day	12 1930 SEPAR Net **2000 SARC Net**	13 **SARC Meeting** 1900-2100	14 **2000 SARC GOTA Net**	15	16 Coffee: 0700 OTC Open 0930
17	18 **Basic Course 19-21:00**	19 1930 SEPAR Net **2000 SARC Net**	20	21 **2000 SARC GOTA Net**	22	23 Coffee: 0700 **Antenna Workshop OTC 09:30-Noon** Contest: **CQ WW DX Contest (CW)**
24 Contest: **CQ WW DX Contest (CW)**	25 **Basic Course 19-21:00**	26 1930 SEPAR Net **2000 SARC Net** **Basic Course Exam OTC 19-21:00**	27	28 **2000 SARC GOTA Net**	29	30 Coffee: 0700 **Basic Course Exam OTC 09:30-Noon**

DECEMBER 2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3 1930 SEPAR Net 2000 SARC Net	4	5 2000 SARC GOTA Net	6	7 Coffee: 0700 Denny's - King George & 68 Ave. OTC Open 0930 Contest:
8	9	10 1930 SEPAR Net 2000 SARC Net	11 SARC Meeting 1900-2100	12 2000 SARC GOTA Net	13	14 Coffee: 0700 OTC Open 0930
15	16	17 1930 SEPAR Net 2000 SARC Net	18	19 2000 SARC GOTA Net	20	21 Coffee: 0700 OTC Open 0930
22	23	24 1930 SEPAR Net 2000 SARC Net	25 	26	27	28 Coffee: 0700 OTC Open 0930 RAC Winter Contest (CW, SSB)
29 RAC Winter Contest (CW, SSB)	30	31 				

Event details: SARC—SEPAR 'Live' calendar link

All contest information: WA7BNM Contest Calendar: Home

Radio-Active

Profiles of SARC members

Meet Andrew Elgin VE7LGN

Coordinated by LARRY BLOOM VE7LXB

Andrew VA7LGN grew up in North Delta and graduated from North Delta Senior Secondary in 2005. He then attended Douglas College where he studied music for 2 years before deciding to pursue a career in insurance. Andrew describes having switched his focus to insurance as a positive change in his career path. Looking back, he feels it was the right call. In fact, Andrew has worked in insurance for 16 years, where he has taken on various roles including as a claims adjuster, a trainer, and in his current capacity as a senior business analyst in the planning and operations department.

Andrew's first time using a "real" 2-way radio was when he was twelve years old in 2000 during an Air Cadet survival exercise. The Cadets were given some old PRC/77 radios to practice radio nets and pro words while running around in the bush. Soon after, FRS and GMRS radios became available and he remembers asking his dad for one of those for Christmas. In fact, he's pretty sure that he still has his first FRS 60 radio somewhere around the house.

Andrew first heard about the Amateur Radio hobby from a fellow cadet officer sometime in the early 2010s. He had intended writing his certification exam numerous times, but other hobbies precluded that until 2021 when he passed his basic with honours. Andrew explains that there isn't much within the hobby that doesn't interest him - POTA, Contesting, Satellites and ARISS to name a few, and building various electronics and radio accessories are all things he's been working on recently. He feels that there really is something for everyone within the hobby, with plenty to keep you busy.

Other than Ham radio, Andrew plays guitar, bass, and drums (not all at the same time mind you). He also enjoys flying his camera drone, and of course being chased around the house by his two daughters, Lily (8), and Paisley (6).

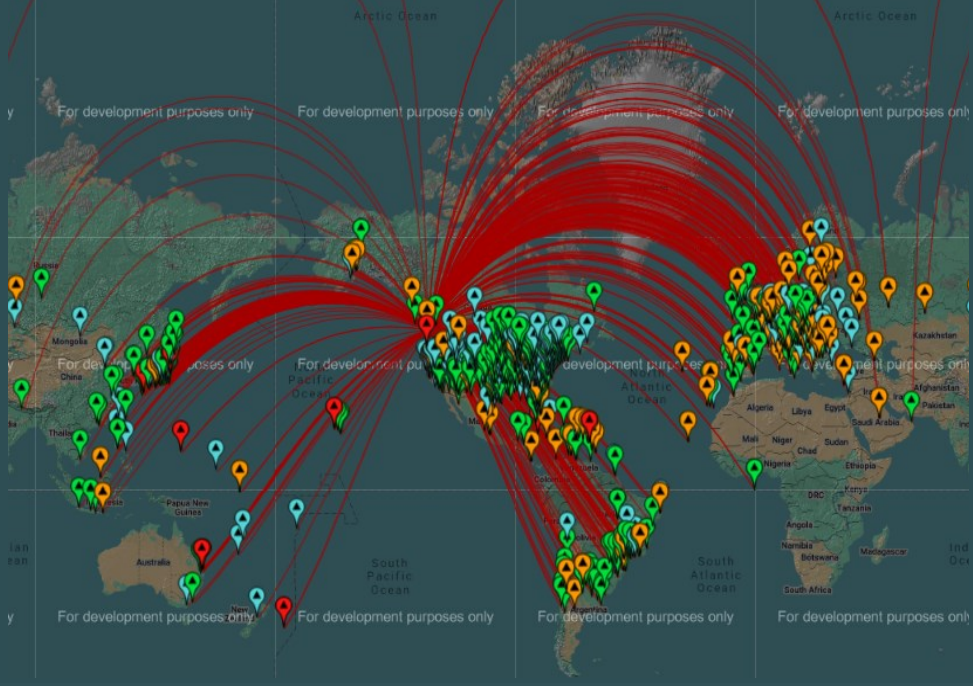
Andrew is an active volunteer with SEPAR and has been since he became certified. He strongly believes that Amateur Radio plays a key role during emergencies and that it's vital that we continue to practice our communication skills regularly so that these skills are well honed should a real disaster occur. Andrew is also a director with SARC, having been elected at the club's most recent AGM. He really appreciates that SARC is so active and that there are always group projects or events to attend. For example, in the past 2 years SARC has offered workshops on WSPR radios, a dedicated satellite station build, and a first of its kind in BC 10 GHz radio beacon. There is always something going on at the Operational Training Centre like Adam's (VE7ZAL) 3D Printing workshop or contesting on the club station. Andrew sees the Surrey Amateur Radio club as a world class group and is happy to be a part of it as he continues his ham journey.

Best of luck going forward, Andrew!

~ Larry VE7LXB

A very special 'Thank you' to a very special lady. Nell VA7PE recently donated $100 to Adam VE7ZAL's High School RF Communications program. Your generosity is much appreciated as is that shown by the members who have donated transceivers for distribution to the students.

The Contest Contender



CQ WW DX Contest

The bands were hot—10m was fabulous

by JOHN BRODIE VA7XB

JOHN BRODIE VA7XB reporting on SARC's contesting efforts.

Going into late Friday, Oct. 25th , it was not looking promising, with a major solar storm predicted and the solar wind predicted to hit earth on Oct. 26th. This level of solar activity occasionally produces radio blackouts. The following conditions were predicted (for a detailed explanation of how to understand propagation predictions, see: Current Ham Radio Conditions - HAM Radio for Non-Techies):

- Solar Flux Index 238 (Hot!)
- K Index 4 (Active)
- A Index 14 (Unsettled)

However, thanks to the high sunspot count, it turned out to be the opposite of what was expected, as the higher HF bands were extremely productive, especially 10 m which was open into the late evening on Friday and Saturday bringing us terrific DX from South America, Pacific regions and Asia. Then next morning 10m and 15m were again open bright and early into Europe and North Africa on both Saturday and Sunday mornings, and the opening lasted all day.

The downside was that the nighttime bands, 40 and 80m, experienced S9+ atmospheric noise and were therefore less productive but, no matter, because 20m was usable most of the night.

Our contest operators were the reliable SSB crew of Sheldon VA7XNL, Mike VE7YEG, Steve VE7SXM, John VE7TI , Larry VE7LXB, Dmitry VA7DVO, Doug VA7JDJ, Kapila VE7KGK and John VA7XB. New contesting recruits, Cristian VA7CTK and Scott VE7KAT, hit the road running under the guidance of Mike and Doug, respectively.

While Sheldon was at work at the VE7SAR station reeling in the Qs on Sunday morning, I came home and cleared the cobwebs off my home station to make a few Qs with Europe and around the world, including Namibia in SW Africa.

10 and 15m bands saw most of the action:

80m	0 contacts
40m	23 contacts
20m	117 contacts
15m	685 contacts
10m	539 contacts
Total	**1364**

Best contact of the weekend was 9N7AA in Kathmandu, Nepal, I believe either by Doug or Scott.

It was loads of fun – thanks to all, especially the first-time contesters who got into the rhythm quickly with only minor coaching.

~ John VA7XB

\

10 GHz Beacon Project

On the cutting edge

by JOHN BRODIE VA7XB

Above: The 10 GHz beacon installed and operating on the roof of Concord Tower

Top of page: The view from Concord Tower Looking North with VA3ELE, VA3TO, VA7SC and VE7NX near the beacon.

To many, amateur radio is just pushing buttons on a radio built by someone else. To others, the hobby offers numerous technical challenges in venturing beyond conventional limits, without any idea of where it may lead.

That is the proud tradition of ham radio, and it was in this spirit that Dino VE7NX and Scott VA7SC decided to collaborate in construction of a 10 MHz beacon, something that only a handful of enterprising hams have done in Canada.

Communicating on 10 GHz is certainly no longer “frontier”, but it is a new experience for us here at SARC. It is our hope that the success of this project will inspire others to take an interest in the super-high frequencies (microwave) and construct their own devices, then attempt line-of-sight communication, rain scatter, or even moonbounce.

The 10 GHz, or 3 cm, amateur band extends from 10.0 – 10.50 GHz with the 10.45-10.50 GHz portion allocated to amateur satellite and the remainder for other modes.

The beacon constructed by Dino and Scott transmits the following CW sequence at 10,368.225 MHz: VE7SAR CN89NE [grid square] followed by a short tone, then repeats.

The beacon and antenna are mounted on a pole at the top of Concord Tower, One Park Place, located at 100th Ave and King George Blvd in Surrey. Running initially at 1 mW, the beacon could be heard throughout the Lower Mainland of BC where line-of-sight to the antenna or a suitably reflecting surface exist.

Let's look at the construction of the beacon as it will be when complete with amplifier (by the time you read this).

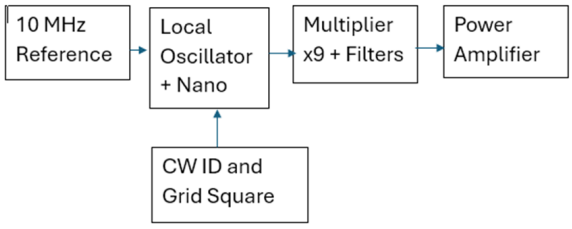
The local oscillator, operating at 1152.025 MHz uses an ADF4351 chip, controlled by Arduino, driving a W1GHZ 9x multiplier and filters to achieve the output frequence of 10,368.225 MHz.

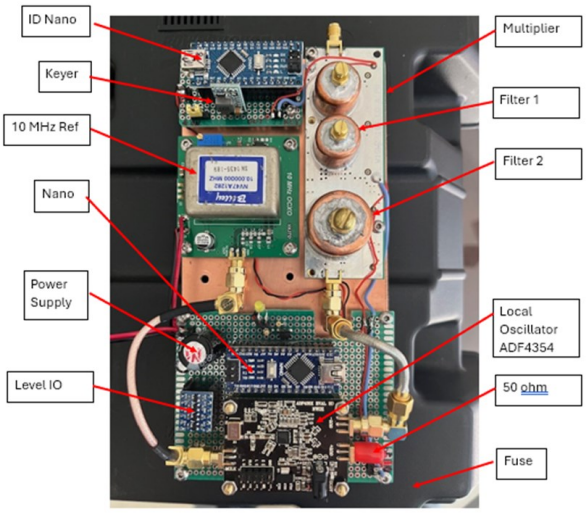
A 10 MHz oven-controlled crystal oscillator provides the reference to ensure frequency stability. Keying is controlled by a second Arduino chip, programmed with CW callsign and grid square.

A DB6NT power amplifier runs at 50% output to provide 100 mW reliable continuous service without overheating. The amplifier connects to a 12 slot 10 GHz antenna for omnidirectional propagation covering the Greater Vancouver area. The box runs on 13.8V obtained from the repeater room below the roof level.

Full credits to Scott and Dino for this great accomplishment, which was completed and in operation (absent the amplifier) before the MUD (Microwave Update 2024) conference on October 3-4 in Delta.

~ John VA7XB





The second generation of beacon constructed by VE7NX and VA7SC before addition of the 100 mW amplifier.

On the roof of Concord Tower to inspect the 10 GHz beacon are Ontario visitors attending the MUD Conference, Paul Prabucki VA3ELE and Hugh Alexander VA3TO, along with Dino VE7NX, Scott VA7SC and John VA7XB.

2m, 220 and 440 antenna array at Concord Tower. The 10 GHz beacon can be seen on the pole at RHS

September 2024

SARC General Meeting minutes

September 14, 2024

Recording Secretary MIKE PORISKY VA7YEG

SARC General Meeting Minutes 24.09.14

Attendees:

Start Time: 7:02pm

Location: Surrey Fire Training Centre, 14923 64th Ave, Surrey

Welcome & Presentation of Agenda - Steve M.

Guest presentation

Tonight's presentation will be received from Wayne Vale VE7WVX on the topic of "An introduction to the World of D-Star" encompassing D-Star reflectors, digital voice simplex, digital data and picture sharing. Wayne presentation covered power usage, available repeaters and the 2 types of repeaters (open and registered), transmission packets, and the use of ICM and RAG (A=23 cm, B=70 cm, c=2M). The Icom ID-52 was used in demonstrating the transfer of video images using DV mode.

Break 19:52-20:18

Business Meeting

Announcements:

- Reminder that Erich Burr's celebration of Life will take place on Sept 21. RSVP was necessary so if you have not already RSVP'd then attending is not an option.
- Joe Kloc became a silent key earlier this month. Dino updated the club that Joe's son would like to acquire his dad's call sign and Dino will assist in the process. The service is not yet planned and it may take place in Quebec. Ivanka will keep Dino updated. Gord commented about his visit

with Joe several years ago.

- SARC has reserved 3 tables at the Delta Swap Meet taking place on Sept 22. Any members that would like to help out or have personal items to sell should contact Steve. John B. will not be available. Shawn mentioned that Ken will be present at the swap meet to hand out QSL cards if anyone is waiting to receive some.
- Steve reminded everyone about the weekly breakfast at Denny's (7 am, 6850 King George) and reminder that OTC will be available to everyone after breakfast - 10 am to noon.
- John B. sends out the SARC Bulletin on the first and third Wednesday each month. Members are encouraged to review the email to find out what activities are planned. Also, if anyone would like to add content, forward the details to John B. at brodiejb@shaw.ca.

Committee Reports

- **Financial Report** – Steve M. Scott's father recently passed away so Scott will be absent for the next while. Because of this, the most recent bank statements are not available. The Profit & Loss and Balance Sheet statements were displayed for the members to view.
- **Nets** – Reg N. (VA7ZEB) All nets are going well. Reg commented about the 'reminder' email that is sent out each day that a net is scheduled. If anyone does not want to receive email reminders, they can click the link to be removed. Reg has now assumed the management duties for the SEPAR net; assigning and ensuring that NCOs are available.
- **SEPAR/OTC** – Gord K
  - Thanks to Reg to taking over the SEPAR net
  - Gord reviewed his involvement during the Run-Surrey-Run event. He was present in the Emergency Operations Centre working with other Surrey agencies. He commented that the RCMP appreciated the contributions of the cyclists and also recognized the support provided by SEPAR radio operators.
  - Organizers will be reviewing the use of WhatsApp as there were significant delays in the messages getting through.
  - Gord will be updating the registered SEPAR list. An email will be sent out to all SEPAR members to confirm their ongoing interest to remain involved.
  - Gord read a Thank You card that was received from Ed Sebulsky's daughter Deb, along with a $500 cheque in appreciation for helping sell his estate items at the Richmond swap meet.
- **Membership** – John B. John introduced 2 new members present: Ward Conley (VE7WCP) and his parrot Pacco and Grace (VA7LZT) who commented on her involvement with the Summer School project.

  Paid membership is 135. A few members did not renew but we are gaining more from the upcoming Basic class. A notice was sent out to the previous 2 HAM classes letting them know that the free period has expired and membership renewal is due.
- **Contests** – John B gave an overview of the Route 66 special event – radio stations on the first highway from Chicago to Los Angelas will operate for 1 week. QSL cards are available if you make a contact and a certificate is presented for making 7 (or 8) contacts. Minimal antenna and power is required because all stations are in the US; relatively close.

  There is a SSB contest this weekend. Anyone interested in participating should contact John at brodiejb@shaw.ca.

  The CQ WW RTTY contest will take place on Sept 28/29. SARC will be participating as a club and anyone interested should send John their preferred dates and times.
- **Repeaters** – Steve M. All repeaters are operating normally.

- **HAM Classes** - John S

  John gave a recap of the summer school project where 24 students were introduced to a career involving radio transmission of some kind. SARC was approached by their teacher Adam Drake VE7ZAL to teach the basic HAM class during the month of July. Donations were received from UBC and the school purchased 12 handheld radios. John Schouten covered the HAM content and many other operators presented specific subject matter relating to the course. 20 Students received their HAM certificate including 3 that passed the Advanced level. The course included many guest speakers including launching Pico Balloons (Adrian VA7NZ/Scott VA7SL), a demo of IRLP, POTA, Dmitry VA7DVO, and Satellite communications (Adrian, VA7YEP). Several exam makeup dates were set to allow a few students additional attempts to pass the test. Lastly, Grace VA7LZT gave a brief overview of the course from her perspective as a student. An article on the entire program is available in the September-October Communicator.

Old Business:

- **Run Surrey Run** - John S. A recap of the Run-Surrey-Run event was presented by John S. There were 19 SARC volunteers and 1 cyclist from Vancouver. The number of cyclists were absent until the day before the event. The organized told John S. that they were impressed by SEPAR's involvement. WhatsApp was found to be OK for routine messages but not when immediate responses were needed.

2024—2025 SARC Directors

- **Activities -** Steve displayed a collage of photographs taken during SARC's summer events including a satellite contact, Field Day activities, Barbeque, White Rock parade and various swap meets .
- The current position of Directors was reviewed following last month's Annual Meeting.
- Adam Drake VE7ZAL offered to teach a class to SARC members covering 3D printing and CAD software (OnShape) with a quick intro to selecting projects from Thingiverse. The course is scheduled for Saturday, October19 at the OTC. A signup sheet was emailed to all members. There are currently 16 participants signed up with room for a few more. Reply to the email if you are interested.
- OTC Projects: nothing planned at this time.

New Business

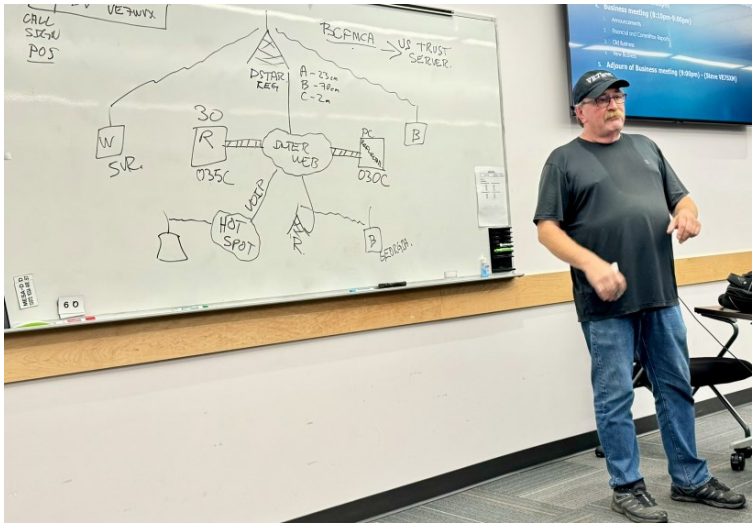
- Adam Drake VE7ZAL is asking members for handheld radios that are no longer needed, to be distributed to those completing the Summer School HAM course. Anyone with an unwanted radio can pass it on to Reg (VA7ZEB, who will forward it to Adam.
- Reg asked about the status of the HF antenna that was taken down for repairs. Steve provided an update indicating the cost of a new antenna would be over $1000. We are still waiting to see it the antenna can be fixed. Gord K. (VA7GK) has a second antenna to consider.
- Call for additional questions or new business – nothing received.

Adjournment

- Steve moved to adjourn the September general Meeting
- Seconded by Rob C. VE7CZV, carried at 21:02.

~ Minutes prepared by Mike Porisky VA7YEG

September meeting, the OTC and events



Left: Wayne presents at the September General Meeting.

Below: Photos of Run Surrey Run and of the RF Communications course students' antenna workshop.

October
2024

SARC General Meeting minutes

October 9, 2024

Recording Secretary MIKE PORISKY VA7YEG

SARC General Meeting Minutes 24.10.09

Attendees:

Start Time: 7:03pm

Location: Surrey Fire Training Centre

Welcome & Presentation of Agenda - Steve M.

Guest presentation

Steve introduced Scott VE7SL and Adrian VE7NZ who presented information about deploying Pico balloons and High-Altitude balloons. Both topics covered what equipment is required, any legal restrictions, deployment process, etc.

Pico Balloons are sent to an altitude of 12-14 km with a goal of traveling around the world - hopefully many times. They are made of Mylar, 32inches in diameter and weigh less than 20 grams. A GPS is included to track the location on the website sondehub.org.

Challenges include controlling balloon height (determined by amount of Hydrogen added), GPS outages along the route, temperature and solar radiation. The ballon transmits .27 Watts, WSPR mode on the 20 M band.

High Altitude balloons carry a host of instruments up to an altitude of 50,000 feet (or more), including GPS, camera, APRS, weather instruments, detectors, etc. The challenge is to accurately predict at what altitude the balloon will burst (based on size, amount of gas and temperatures along the

way) and more importantly, where the balloon will land. A chase vehicle is used to follow and collect the balloon when it lands. In the past, Adrian & Scott have attached repeaters to support VHF/UHF communications at great distance.

Following the presentation, John S. presented a cheque to Adrian & Scott to support ongoing projects.

Business Meeting

Announcements

- **Erika's Story** – a video created by the Surrey Library to highlight Erika's immigration and career journey was played for the membership. The video featured Erika's involvement with SARC and showed activities relating to radio operation.
- **Satellite Station** - With Adrian's (VA7YEP) move to Ontario, SARC does not have a manager of the satellite station. The call was put out for any members interested in learning how the satellite station worked, and to request a one-on-one training session with Dino.
- **Beacon Project** - Dino's 10 GHz beacon project has been installed on the Concord repeater site. Operating 1 mW, the beacon has been heard 30 Km away. It has now been in place for 3 weeks. The next step is to set up a SDR with a satellite dish to demonstrate how the signal can be monitored. Next year's plan is to increase the beacon frequency to 24 GHz. Dino has submitted the information to the RAC magazine.
- **VE7MPI Move** - Fred is moving into a smaller condo and has some equipment for sale.
- **The SARC bulletin** goes out every second Wednesday. If you are not receiving it, contact John VA7XB.
- **The next monthly meeting** will take place on November 13, same location.
- **Saturdays** - Reminder that SARC members meet for breakfast every Saturday morning at Denny's restaurant (6850 King George Blvd) at 7:00 hours. Following breakfast, the OTC is open to everyone.
- **Advanced Study Group**—Reg (VA7ZEB) Takes place following the Tuesday SARC net (approximately 2030 hours)

Committee Reports

Financial Report – Scott H was not present tonight. Steve displayed the Balance Sheet, indicating that a newer version was not available at this time.

Nets – Reg N

- All nets are operating well.
- Reg introduced the 220 net that takes place at 19:30 hr. on the last Sunday of each month. This is not a chat net but rather an opportunity to check in and receive a radio status report.

SEPAR/OTC – Gord K

- The Great Shakeout will take place on Thursday, October 17 at which time SARC will set up the SEPAR net to simulate and practice emergency communications. All members are encouraged to participate starting at approximately 10:15 hours. This year, students from various high schools will also take part in the SEPAR net.
- Gord presented Long-time service pins to SEPAR members John Brodie (15 years) and Stan Williams (10 years). Each received recognition from the Provincial government as well as the Surrey Fire Chief.

Membership – John B

- 138 members and still growing this year. John indicated that the losses are predictable the SARC seems to gain more members to compensate for those who do not renew. With the current Basic course now underway, the Society should have more than 150 members by the end of the year.

Contests – John B

- On October 26/27 the CQ World-wide SSB contest will take place. Members wishing to participate should submit their preferred date and times to John B.
- On November 23/24 the same contest using CW will take place. For more information or to see other scheduled contests, visit the website "ContestCalendar.com".
- John B. also summarized why SARC wants to take on new projects – stating that we want to be seen as an innovative club, supporting the latest technology.

Repeaters – Steve M

- All repeaters are operating normally.
- Reg (VA7ZEB) - The 220 repeater is getting more use.

Ham Classes - John S

- 50 participants are signed up to the latest Basic course. Most are local but several are from across Canada and 10 are from the Castlegar Search & Rescue.
- The new Basic exam question bank likely goes public in January, 2025. The Advanced exam questions have just been submitted and are still a year away from being used.

Old Business

- **Delta Swap Meet** – Steve M. SARC had 3 tables at the Delta Swap Meet and sold 53 items for a total of $1044

SARC made a donation to the balloon program

- **The 3D Printer worksh**op will take place on Saturday, Oct 19 at the OTC. The course is currently full with over 20 participants/ observers. The OTC will be closed from socializing activities during the course.
- **The OTC roof** needs to have leaves removed. Help would be appreciated next weekend. Andrew volunteered to bring his leaf blower.
- **School Program** - Adam is still looking for handheld radios that he can give out to new HAMs that took part in the Summer School project. If anyone has a handheld radio that they do not use, please relay through Reg (VA7ZEB).
- **OTC Expansion** - Dino asked if there was any more information regarding the small room that could be used for testing radio equipment? ANSWER: Steve M. – Nothing received yet.
- **Pi Workshop** - Sheldon put out a call for members interested in building Raspberry Pi hardware – perhaps a workshop. Raspberry Pis are now readily available at "pishop.ca".

New Business:

Food Bank - Darryl (VA7CQD) suggested that SARC collect either food donations or cash to be donated to families for Christmas.

Adjournment:

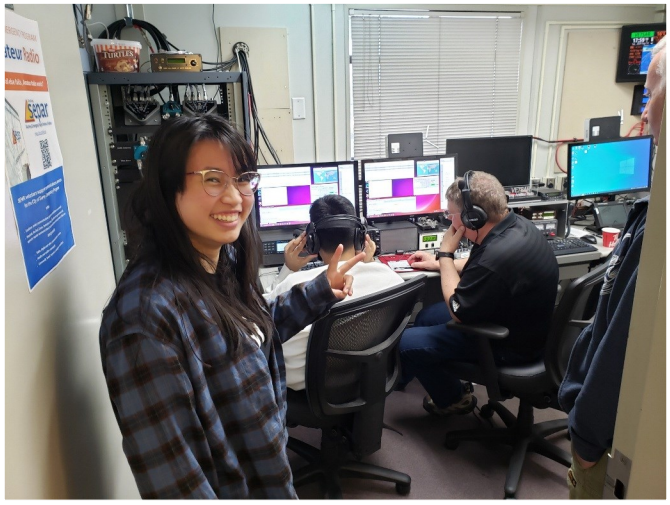
- Reg (Va7ZEB) moved to adjourn the meeting
- Seconded by John S (VE7TI), carried.

October meeting adjourned at 21:03 hours.

~ Minutes prepared by Mike Porisky VA7YEG

October at the OTC

Above, right, and below: RF Communications course Summer school students discovering HF

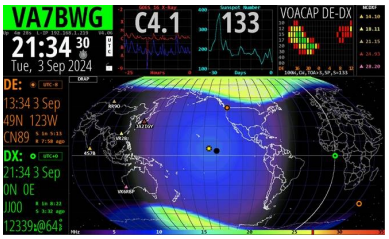


Kudos, and hunting for old VE7QE QSL cards

by BLAKE R. WIGGS VA7BWG

Congratulations on another terrific issue of the Communicator! I read the whole thing cover-to-cover. Now I need to go back and re-read the 50% that I didn't actually understand.

I sure envy the kids in the summer high school course! I wish I could have parachuted in and listened to the speakers, participated in the labs & the outdoor sessions. What a terrific experience for the students—I'm not surprised that so many of them passed the course.



I enjoyed the "HamClock Webserver on a Raspberry Pi Zero" article too. I stumbled across HamClock a few weeks ago. I don't have a Raspberry Pi, but when I realized it runs on Linux I tried installing it on a Linux Ubuntu virtual machine and sure enough, it worked. It took me a while to figure out the DX Spider / DX Cluster settings, but once I did the light bulb went on: HamClock is fairly pointless if I don't have an HF radio. It makes a great screen saver though.

I've been looking into historical QSL cards, hoping to find some of my father's cards. I have one of his VE5QE cards *(see image)*. The folks at ISED were able to tell me that Dad was allocated that call sign on October 9th, 1935. He would have been 16 years old—and here I am just getting started in my mid-seventies!

As you're probably aware, between 1929 and 1946 amateur radio operators in British Columbia, the North West Territories and Yukon Territory were allocated call signs prefixed VE5. I knew that Dad had the call sign VE7FFF when he became a silent key in 1994. I also knew that he must have had several other call signs allocated by different provinces as the military moved him around.

Fortunately I came across the Internet Archive's historical (but apparently incomplete) collection of Radio Amateur Call Book Magazine. Searching through that, I found another 4 of Dad's call signs: VE1ZG, VE3DTM, VE4FQ and DL2AS. A couple of those listed interesting addresses. For example VE1ZG was Dad's call sign in 1949-1951 with his address listed as "18 Carrier Borne Air Liaison Section, R.C.N.A.S., Dartmouth, Nova Scotia". I found Dad's DL2AS call sign in the "DL2 – British Forces in Germany" section of the 1962 edition of Radio Amateur Call Book Magazine, with his address listed as "c/o JCEB. HQTRS. BAOR. BFPO 40" which I think translates as something like Joint Canadian Europe Brigade, Headquarters, British Army of the Rhine, British Field Post Office 40.

The hard part will now be to see if I can hunt down any QSL cards with those other call signs. I've reached out to Bob Green W8JYZ for possible leads. He says that he has thousands of historical QSL cards that aren't in his https://oldqslcards.com/ online database.

Is anyone aware of any other collections that I could check?

~ Blake VA7BWG

SEPAR

The Great ShakeOut

by GORD KIRK VA7GK

Gord Kirk VA7GK is a SARC Director and the SEPAR Coordinator

Once again SEPAR participated in the BC Shakeout Exercise. This is an annual event to help remind people of the potential for an earthquake to impact our area of the country. Like our southern coastal neighbors in Washington, Oregon and California, Coastal BC is an area at risk to earthquakes. As a result, the annual Shakeout Exercise is designed to remind people of the risk, to provide tips on how to prepare for an earthquake and what to expect if a larger quake occurs.

Each year on the third Thursday of October at 10:17 we experience a "planned earthquake". People are reminded to "Drop, Cover and Hold On" during an earthquake. This includes how to protect themselves from falling objects or what to do while driving. It is a good reminder on how to be prepared for family and friends. One of the components for a good plan is your personal communication plan.

This plan includes a contact list of family and friends which you will contact after an event. This will help people to know you are ok and how you plan on reunification. I.e. Where are you going to meet, and when? It might also include your expected route and when you will connect again with each other. This might be by cell phone, text, an app, or your ham radio. You should consider who will be your local contacts and your out of area contacts. Those physically in your geographic area are those you may want to check in with first and know they are ok, or what help they might need. Your out of area contact can help reach out to others for you, so you can concentrate on dealing the earthquake's impacts. Don't forget it is also a good idea to have the phone numbers listed on a card just in case you lose or damage your phone and have to borrow one.

Kwantlen Park High School and other student graduates of the Surrey Summer School RF Communications course took part in the Great ShakeOut Earthquake simulation exercise. They checked into the Amateur Net afterwards to report on the status of their school.

CityTV News was present to record this event, believed to be a first where qualified students became the communications lifeline.

As part of your plan as an amateur radio operator you should consider what frequencies/repeaters you may want to use to make contact and gather information. As part of your preparedness plan have you a spare battery or backup power plan? For handhelds do you have a better antenna than the stock antenna to help improve your signal?

Each week we have a practice SEPAR net where we do our regular check ins on the primary repeater and then move to a backup frequency test which is often via simplex. This means that participants start to understand how they are being heard from their location and how to relay a message if they are not being heard by net control. Part of our net script reminds everyone that during an emergency or disaster the repeater should be used as a primary check-in, and if the repeater is not working to move to our local simplex frequency in the plan.

So, with all of this we were able to hold a net on Thursday Oct 17 just after 10:17am. We had 27 check ins from around the city and neighboring communities. This year we also had several students who recently graduated from a summer school electronics class in which they also were taught the local Surrey Amateur Radio Club (SARC) amateur radio licensing class. https://www.surreyschools.ca/_ci/p/168383/new-radio-frequency-communications-summer-course-in-surrey.

From this, students from around the school district were licensed as Hams. SARC as well as several club members have donated both their time and radios to make this program a success. The teacher Adam Drake VE7ZAL (also a recent SARC class graduate) was the driving force to create and teach this over the summer. After the success of the summer school class, he arranged for students from some of the schools to participate in the Great Shake out Drill. The lead SARC instructor John Schouten VE7TI, who helped teach the class throughout all of July, went to the Surrey School Board Office and the participated in the Net with school board officials watching. As the net started students checked into the net and passed along an update from the school simulating what the school would be doing if the earthquake was real. The school board officials were able to hear the reports from the surrounding area and the schools where the check ins were coming from. The local media were also present and ran a story on the CityTV nightly news.

Overall, this was an excellent example to our community of the value of amateur radio and how it is a great tool to help in a disaster. The students are excited by what they have learned. Many are now participating in weekly nets and coming to Club drop in events. As the news clip indicates some are even recognizing how this could lead to future education plans and a potential career.

At SEPAR we encourage licensed amateurs to get involved, know the local area emergency communications plan and test out your equipment. We often run

across individuals who have their license and even a radio but have not used it. They believe this will provide them their “emergency radio/ communications” during a disaster. We encourage and help them to get their radio programmed, and teach them how to use it with “Get on the Air” classes and nets. SARC includes as part of the radio licensing class an antenna workshop. This teaches theory and has the students finish with their own roll up J-Pole antenna which will help improve their handhelds signal when needed. Unless a class is using the facility on Saturday morning, we host a weekly drop in to visit, work on projects and help those with questions, radio programming, radio installations etc. This helps with our community being better prepared and makes our radio “hobby” a very enjoyable one.

As always if you want more information on SEPAR please reach out. Our website is www.SEPAR.ca

~ Gord Kirk VA7GK
SEPAR Coordinator

Run Surrey Run

by JOHN SCHOUTEN VE7TI

We can once again take satisfaction that our SEPAR Communications team was mentioned as an invaluable part of the Run Surrey Run organization. For the first time the event was competitive, rather than a ‘fun run’, with runners taking priority over traffic. It went better this year than both previous years in large part due to the improved road closure plan. This eliminated many of the annoyances that our team faced with poor traffic management because of inadequate closures.

A strong positive was that we once again had an excellent connection to the City Emergency Operations Centre (EOC). The value of that direct connection was most noticeable when the event start was postponed by police because the route had not yet been fully secured.

I’d also like to single out Grace VA7LZT and Elisabeth VA7EVJ. Grace was one of the graduates of our summer school youth RF Communications course, who came out to participate in RSR. Elisabeth did a stellar job as the only available bicycle-mobile station. That is even more noteworthy given that the day before she participated in the Grand Fondo bicycle event to Whistler. Kudos to both of you.

Of course, along with the usual gratitude of the event organizers and SEPAR for donating your time, I’d like to add my personal appreciation for your individual effort and cooperation. We have a fabulous team and are certain to be invited to next year’s run.

~John Schouten VE7TI
RSR Communications & Emergency Planner

SEPAR members were part of the LDS church earthquake information fair in Surrey. The SEPAR trailer was set up as an information point and Amateur Radio's role in emergencies was demonstrated and explained.

Norman Schmidt VE7IIT—Silent Key

Norm passed away in his sleep October 27th at age 94. Many probably won't remember him but he was a Surrey Club member in the late 70's and 80's. He rejoined the club and was a regular for breakfast for some time before his age caught up with him and his mobility became limited. Around that time, he donated his equipment to the club and the photo is of then SARC President Mike VE7AT receiving some of that gear. An obituary will be published later this week. No service is planned.

Reprint Policies

These are policies for reprints from The Communicator, a bi-monthly journal about amateur radio and other topics published by Surrey Amateur Radio Communications (SARC).

You may use articles authored by SARC members for your club newsletter or other amateur radio publication, provided that the purpose is non-commercial, you credit the author, and provide a link as follows: https://ve7sar.blogspot.com/search/label/SARC%20Communicator. If our article indicates it is from a source outside of SARC, we cannot transfer that right, and you must seek permission to re-publish from the original source. We appreciate being notified via email to communicator@ve7sar.net if one of our original articles has been re-printed elsewhere.

We welcome your comments and feedback

Please consider leaving a comment via email to communicator@ve7sar.net, or on our blog site https://ve7sar.blogspot.ca or, better yet, contact our authors directly, so they know someone is out there reading our publication.

Social Reminder

The Saturday weekly social gathering is once again 'on' at the Denny's Restaurant, 6850 King George Blvd., Surrey BC from 07:30—09:30. All are invited. Afterwards, we will host workshops and will be available to invigilate Amateur Radio exams at the OTC, 5756—142 Street, Surrey from 10-noon.

Bring your ham issues, our Elmers will try to help you sort them out.

SARC news...

Burnaby Amateur Radio Club Swap Meet (9am to noon Saturday Nov. 9)

SARC will likely have one or more tables at the swap meet to be held at the Salvation Army Cariboo Temple, 7195 Cariboo Rd, Burnaby. Come out to help with SARC's table, and members are invited to bring their own items to sell.

SARC Official Calendar
Your official reference for dates and times of events is the SARC Google Calendar, which is updated as details change, so please consult it for last-minute confirmation: https://calendar.google.com/calendar/u/0/embed?src=ve7sar@gmail.com&ctz=America/Vancouver

Requesting Donations of VHF/UHF Radios
Adam Drake VE7ZAL, instructor for the summer radio electronics course of the Surrey School Board, is looking for donations of VHF/UHF radios (handheld, mobile or base station) for use by graduates of the course. Please contact Adam at ve7zal@gmail.com if you have a spare radio that you are willing to donate.

Tuesday Nets
Join the SEPAR net every Tuesday at 7:30 pm and the SARC net at 8 pm on either of the repeaters: North Repeater on 147.360 MHz tone 110.9 Hz or South Repeater on 147.360 MHz tone 103.5 Hz.

Thursday Get-on-the-Air (GOTA) Net
Every Thursday evening at 8 pm is SARC's net for newly certified hams (and more experienced hams who wish to contribute). This net operates on the same frequencies shown above for the Tuesday nets. Participants will help you with your new-ham questions and assist you in getting comfortable using your radio. Check in with GOTA net hosts Wayne VE7WVX and Lesley VE7CMI.

Sunday Monthly 220 MHz Net
Join the 220 net taking place at 7:30 pm on the last Sunday of every month on VE7RSC repeater 223.960 MHz -1.6MHz tone 110.9 Hz. Net Control is Shawn VE7BD. This is not a "chat" net – just check in, exchange signal reports, and get on with your evening.

Contesting Group
To participate in scheduled contests, or if you wish to operate the club station radios on your own time, please reply to membership@ve7sar.net. Coaching will be provided as needed. See WA7BNM Contest Calendar: Home for a complete list of available contests. Our next scheduled contest is the CQ WW DX Contest (SSB) on Oct 26-27.

Incoming QSL Bureau
Any member wishing to receive in-coming QSL cards via the club should send Ken VE7BC an email at ve7bc27@gmail.com or call/text him at 604-816-5775 and the cards will be collected for distribution to the member by Shawn VE7BD. Or, if you are simply wondering if Ken has any cards for you, please contact him.

Projects Group
Dino VE7NX hosts the Projects Group. The new satellite station is set up in the Radio Room and available for members to use. If you wish to **schedule** a time to make satellite contacts, send an email to membership@ve7sar.net or just show up Saturday mornings. For those new to satellite communication, individual coaching will be scheduled for the coming months. Respond to this email if you wish to learn more about it.

Equipment for Sale

Fred VE7MPI is moving and has several items for sale, including: Kenwood TS-120S, ICOM 756PRO with power supply, SM-20 Desk mic, MFJ Auto-tuner, vertical and wire HF and 220 antennas, lots of other items, including tools etc. Contact Fred – 604-543-2678.

Ham Leftovers...

'Ancient' radio

John White VA7JW's presentation on 'Ancient Radios' was made ten years ago, but the subject is still current. You can enjoy his historical look back at on YouTube at: https://www.youtube.com/watch?v=iKZpf3QlK3o

APRS for beginners

We learned of a website on "Understanding the Basics of APRS and How to Get Started in APRS" at https://k0pir.us/aprs-basics-for-beginners/?utm_source=amateur-radioweekly&utm_medium=email&utm_campaign=newsletter

Are Canadian hams at risk of losing the 902-928 MHz band?

NextNav, Inc. is the developer of a 3D geolocation service known as Metropolitan Beacon System (MBS), a wide-area location and timing technology designed to provide services in areas where GPS or other satellite location signals cannot be reliably received. MBS consumes significantly less power than GPS and includes high-precision altitude. NextNav are now petitioning the U.S. Government to give them complete and exclusive control of the 902-928MHz band. See details at https://yro.slashdot.org/story/24/09/16/0059226/eff-decries-brazen-land-grabattempt-on-900-mhz-commons-frequency-used-by-amateur-radio

…and another article that may clarify the issue further: https://www.eff.org/deeplinks/2024/09/nextnavs-callous-band-grab-privatize-900-mhz

Antenna use by frequency band among Canadian amateur operators

In his final installment on the analysis of the RAC Survey 2021 of Canadian amateur operators, Frank K4FMH looks at frequency use by ham operators.

We made a hot dog talk!

Hopefully this video will not spawn people heading to their local AM stations and killing themselves! YouTube: https://www.youtube.com/watch?v=GgDxXDV4_hc

Is it time to move away from the PDF Newsletter?

Point/Counterpoint

by KEVIN McQUIGGIN VE7ZD & JOHN SCHOUTEN VE7TI

Citing the Limitations of PDF, on his blog, Midnight Cheese, Cale Mooth K4HCK wrote:

"It's time for ham radio clubs to move away from the PDF based newsletter as a primary publishing format.

The purpose of this post is to help amateur radio clubs and organizations get their content in front of more hams. The PDF format is problematic because it acts as a walled garden, limiting the ways in which the content inside can be discovered by search engines, social media, and ultimately the hams looking for good information.

Generally, search engines can't read the content within a PDF. That means even if a PDF is made available on a club website, Google may not be able to see the articles inside. Search engine algorithms are designed to read text and HTML, not the ASCII encoded PDF format. If a ham is searching for a topic that matches an article in your newsletter, that ham may never see it.

If you've ever linked to a web page on a social media platform, you've likely seen the article represented with an image, a clear title, summary, and source. This isn't possible when linking to a PDF. As a result, viewers miss critical information that might describe the newsletter, much less any articles within."

Cale further cites that it's too much content all at once:

"Remember that your newsletter is competing against thousands of other online sources of ham radio content. Any single day a ham can read dozens of new blog posts, articles, videos, emails, and more. Ask yourself as a reader what's easier to consume on any given day: A drip of smaller, consumable daily insights or a PDF that contains dozens of articles. Just reading the table of contents can be the cognitive equivalent of reading a handful of social media posts or viewing a couple short-form videos."

Cale gives our publication, The SARC Communicator as an example:

"The SARC Communicator is an excellent newsletter that features articles about many cutting-edge aspects of ham radio such as AREDN mesh setups, HamClock, and the Raspberry Pi series of computers. The September October 2024 issue contains a great article about setting up an AREDN node on Vancouver Island. The article discusses the use of line of sight tools and successfully testing a connection 50 km in distance! This would be a great resource for any ham looking to learn more about establishing an AREDN connection.

Over on Google, I entered a very specific search phrase that included the title of the article and the author's callsign, "aredn ham radio mesh network from comox on vancouver island." No results. Even though the PDF is hosted on Google Drive and linked from Blogger (a Google

property), Google can't see it. This leaves a lot of good information out of reach from hams looking for AREDN resources."

To sum up Cale's position, ham radio clubs are encouraged to move away from using PDF newsletters as their primary publishing format to improve accessibility and discoverability of content. It is reasoned that PDFs present several issues: they limit search engine visibility, which hinders the ability of Google and other platforms to index the information within, making it difficult for new users to find content through search. PDFs also lack compatibility with social media, where articles presented with images and summaries are purported to be more engaging and shareable. Moreover he argues, lengthy PDF newsletters can be overwhelming compared to smaller, frequent updates, which are more reader-friendly. We would respond that lengthy articles, such as some found in this publication, would be almost impossible to present effectively in a blog format.

Cale states that a PDF can also create a barrier to content that would be useful to the amateur radio community. As an example he mentions that insights from newsletters like our SARC Communicator are often invisible to a broader audience simply because the information is locked within a PDF format. He suggests that shifting to formats optimized for web and social media could help more amateur radio enthusiasts discover valuable insights more efficiently.

Kevin McQuiggin VE7ZD/KN7Q offers a counterpoint. Amateur radio isn't an activity that needs to hook a "scroller" or produce marketing snippets that will attract "likes". "Likes" are irrelevant and have no relationship at all to accuracy nor, to the helpfulness of the posted information.

"Text bites" and social media posts cannot fully inform the reader or support real learning. Amateur radio is a progressive learning-centred hobby, and many of the topics that magazines and newsletters cover are complex. To try to present these topics as summarized social media posts undermines learning, and hence our hobby, as the medium cannot effectively convey the breadth nor the depth of the topic.

PDFs are indeed searchable, and correct use of search engines (or rather, the use of correct search engines like https://scholar.google.com/ or the excellent Amateur Radio Archive), can indeed generate hits in even very lengthy PDF documents. In any case, technology should adapt to human standards rather than force humans to modify their behaviour in order to serve the capabilities of technology.

Challenging the reader to perform accurate searches and requiring mental focus in the process is a good thing. "Easy" does not imply "correct". If research (i.e. searching the web for complex information) is not easy then it will help individuals develop their critical thinking and analytical skills and recover factual information. Many of society's weaknesses today are arguably caused by the assumption that everything should be easy.

A publication guides the reader, sets a perspective, and creates its own little world with each issue: one that that readers grow to understand and enjoy. Readers expect a different experience reading "Science" than they do reading "People" magazine. A publication sets the tone for the culture of an organization.

A PDF is similar to a book in that it brings together a complementary set of thoughts that define the state of a club or a subject at a specific point in time. Together, a set of publications set out a path that delineates the history of an organization or a topic. This path documents history. It is important to document history to inform future generations. Social media posts are transient and fractious.

To paraphrase the philosopher Aristotle, "The whole is more than the sum of its parts": a fulsome PDF will always provide more context and better information than a set of short social media posts.

Laura VE7LPM also got in touch and made the observation that when a document or comment is posted to social media, under common EULAs (End User License Agreements - that box you check when you sign up for the service), the author releases ownership of the material to the social media site. The site now owns your material. If you make a post about some new discovery or technology, when you post about it you have automatically given up all ownership of the idea or discovery. Using PDF allows contributors to retain ownership of their material.

~ Kevin VE7ZD/KN7Q & John VE7TI

Our SARC directors believe that we are publishing a journal in PDF format that far exceeds what we could offer on a blog. As editor, I would appreciate hearing an opinion from our readers. If you care to provide feedback, you can email us at communicator@ve7sar.net

SARC SOCIETY DIRECTORS 2022-2023

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treasurer at ve7sar.net

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Andrew Elgin VA7LGN
andrew.elgin at gmail.com

Gord Kirk VA7GK
(SEPAR Liaison)
SEPAR at ve7sar.net

John Schouten VE7TI
(SARC Publications/Blog/Social Media & Courses)
communicator at ve7sar.net
course at ve7sar.net

Stan Williams VA7NF
flowbased at shaw.ca

SARC MEMBERSHIP, CONTEST & OUTGOING QSL MANAGER
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membership at ve7sar.net

SARC REPEATER MANAGER
Horace Bong VA7XHB
repeater at ve7sar.net

SARC NET MANAGER
Reg Natarajan VA7ZEB
net at ve7sar.net

A look back...

At The Communicator—December 2014

Past Communicators are available at:
https://ve7sar.blogspot.com/search/label/SARC%20Communicator
or search the complete Communicator contents & index at:
SARCindex

November & December

The holiday season is upon us. We hope that you get some 'Ham' in your stocking, but in any case we wish you a very happy and healthy holiday.

The topic for our November meeting at the Surrey Fire Service Training Centre is " Amateur Radio in Space - an Introduction to Amateur Satellites and beyond", with the presenter Rick Richards VE7WF/VE7SKY.

SARC hosts an Amateur Radio net each Tuesday evening at 8 PM. Please tune in to the VE7RSC repeater at 147.360 MHz (+600 KHz) Tone=110.9, also accessible on IRLP node 1736 and Echolink node 496228. On UHF we operate a repeater on 443.775MHz (+5Mhz) Tone=110.9 or IRLP Node 1737.

We have a '**Get On The Air**' net directed at new hams on Thursday evenings at 8pm, on our 2m repeaters: North: 147.360MHz+ Tone=110.9Hz and South: 147.360MHz+ Tone=103.5Hz. Our SARC Elmers will be on hand to answer your questions.

Down The Log…

SARC Monthly Meetings

2nd Wed. (Sept-Jun)
1900 hrs at the Surrey Fire Service Training Centre, 14923 - 64 Avenue, Surrey, BC. Here is a what3words link and map: https://what3words.com/markers.addiction.ozone

Weekly SARC Social

Saturday between 0730 and 0930 hrs at the Denny's Restaurant, 6850 King George Blvd., Surrey BC

Workshops

Saturday between 1000 and Noon at the OTC 5756 142 Street, Surrey

SEPAR Net

Tuesday at 1930 hrs local on 147.360 MHz (+)
Tone=110.9

SARC Net

Tuesday at 2000 hrs local on 147.360 MHz (+)
Tone=110.9

VE7RSC Repeaters

2m North: 147.360MHz+
Tone=110.9Hz
IRLP node 1736
Echolink node 496228

2m South: 147.360MHz+
Tone=103.5Hz Fusion capable; No IRLP/EchoLink

1.2m: 223.960 Mhz -1.6
Tone=110.9Hz

70cm: 443.775MHz+
Tone= 110.9Hz
IRLP node 1737
WiRES-X Room ID 00047

We Have A SARC Patch!

These are suitable for sewing on a jacket, cap or your jammies, so you can proudly display your support for the club.

The price is $4 each or three for $10 and they can be picked up at a meeting or the weekly Koffee